VOL. XVIII NEW YORK—THURSDAY, MARCH 19, 1908—CHICAGO No. 12

THE AUTOMOBILE

PREPARING FOR SAVANNAH'S GREAT MEET

SAVANNAH, GA., March 17.—Savannah is on the eve of its great auto races, which bid fair to inaugurate in the South a new era in the vogue of the motor-driven vehicle. The automobilists of the North and West are lending their brethren of the South a helping hand in the conduct of what promises to be a series of memorable contests—in fact, the inaugural of a form of motor-car speed competition that will give to a manufacturer his best chance for the demonstration of the speed qualities of his normal product, and to the public a most convincing exploitation of the various makes of stock cars entered.

For the promotion of the races and the truly masterly attention to the details of preparation, and the unstinted liberality in providing an unequaled course for racing, as well as everything for the convenience and safety of both contestants and spectators, practically undivided credit is due the members of the Savannah Automobile Club and of the citizens' committee of the semi-tropical Georgia city. What the experience of the A. A. A. racing and technical boards members and their chosen officials will add to the success of the meet will be demonstrated by the results at the conclusion of the program.

The tom-toming scribes of the press have not let the general and motoring public forget that there was no Vanderbilt Cup race last year, nor that the rules for stock car competition roughly outlined by the committee of makers last summer still lay upon the shelf.

The motoring Savannahans believed that they had a fit course, were willing to spend the money to promote the races and, best of all, were able to guarantee the military and police protection demanded by the Racing Board as the *sine qua non* of their cooperation in their promotion of a really national competition. The A. A. A. and the S. A. C. wanted a race, and they got together, and that was all there was to it. The result is that the perfection of the preliminaries promises the best course and the best run races in the history of motoring in this country.

Again, let the credit be given to the Savannahans. They have proven themselves true sportsmen. They have not been out for the almighty dollar. Their first thought has been the success of the race. They have spent their money like true Southern thoroughbreds, and "D——n the expense, Sah!"

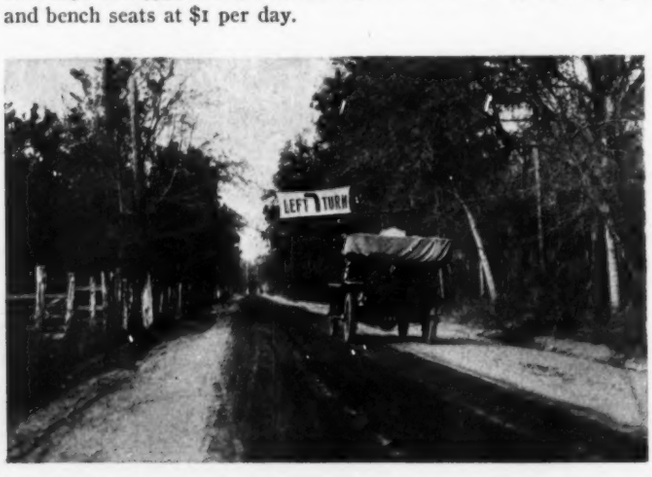
These Georgians have higher ambitions, though, in race promotion. Their aim is to demonstrate to the American Automobile Association that they have a more than merely available course for the Vanderbilt Cup race, and that they are capable of affording adequate facilities and preparations for it. They

Poole in Isotta-Fraschini Returns from Practice Run and Tells Officials of Fine Condition of Course.

Bridge for Trolley Passengers Over the Course.

will surely have to be considered in the award of the course when it comes up for official consideration.

It can be truly said that never have the racing autoists of either continent had supplied them the equal of this 18-mile circuit as a long-distance race course. It is level. It is smooth. It has room for two cars to pass at its narrowest, and for several to drive abreast at its broadest, point. In the run through Thunderbolt and the Isle of Hope, it presents a corkscrew of turns that will well test the skill of the best drivers. It lacks hills utterly. On its stretches, it admits of the ultimate of speed and a pace of almost a mile a minute around its turns. Sustained maximum speed will go far to test engine endurance by way of atoning for the lack of strain hill-climbing would afford. The Savannahans have practically built a race course. They have made sharp turns easy by gradually rounding and elaborately banking them at places even with cement. In easing the corners, they have cut ruthlessly through private property and even front yards, but with the ready acquiescence of the hospitable and sportsmanlike owners. They have rebuilt bridges, so that the planks shall run longitudinally. They have leveled the railroad crossings. They have built bridges across the course for the transfer of trolley passengers. They have refined the entire surface of the circuit. They have established fifteen telephone stations. They have erected a grandstand with 5,000 seats and 65 boxes; provided 50 parking spaces for motor cars; have erected separate judges' and press stands; have shut off the homestretch with an impenetrable wire barrier, and their steamship companies have given autoists such cheap rates for transportation of their cars that a New Yorker may take his machine to Savannah and back for $15 They have not sought to make a gold mine of their grandstand. Boxes, seating six, are sold for the two days for $35; seats, with backs, for the two days, for $2.50, and bench seats at $1 per day.



One of the Signs that Indicates a Turn Coming.

N. H. Van Sicklen, of Chicago, chairman of the A. A. A. Technical Board, has been here for three weeks, assisting the local committee in its preparations for the race. The vice-chairman of the Technical Board reached here Sunday morning. These two began at once their task of examining the cars as to their compliance with the stock car rules. Fred J. Wagner, official A. A. A. starter, arrived here on Thursday to familiarize himself with the course and the details of the conduct of the race.

On Sunday afternoon, there came from New York, Chairman Jefferson deMont Thompson, Vice-Chairman Frank C. Webb, Lewis R. Speare, Stanford L. Haynes and A. G. Batchelder of the Racing Board, and National Secretary F. H. Elliott. They immediately got in touch with the local committee, going over the course in the afternoon and holding a joint meeting that evening. A considerable contingent of newspaper men from New York and Philadelphia was already on hand.

Dangerous Turn on Isle of Hope that Is Banked.

Chairman N. H. VanSicklen, A. A. A. Technical Board, and President Battey, Savannah Automobile Club.

The 180-mile race for cars under 375 cubic inches piston displacement will be started at 10 o'clock Wednesday morning. The condidates on hand are the Automotor Company's 50-horsepower Pennsylvania, L. J. Zendell, driver; the E. R. Thomas 40-horsepower Thomas-Detroit, B. J. May, driver; Apperson 24-horsepower, Herbert Lytle, driver, and a second 40-horsepower Thomas-Detroit, S. B. Lorrimer, driver.

The same day, at two in the afternoon, the 180-mile race for cars over 575 cubic inches piston displacement will be run. But two of the five entrants are here. George Salzman will drive a six-cylinder Thomas Flyer of 70 horsepower, entered by J. F. Kiser, an Atlanta amateur, and Frank Leland, the 45-90-horsepower six-cylinder Stearns, nominated by E. H. Inman, of Atlanta. It is expected that the 60-horsepower Matheson, entered by its maker, which J. B. Ryall will drive, will get here,

but small hope is entertained of the appearance of either the 50-horsepower Gearless, entered by the Gearless Transmission Company, of Rochester, or the 50-horsepower Austin.

The big 360-mile race for the Savannah challenge cup will be started at 10 o'clock Thursday morning. All eight candidates are here. They and their numbers are:

1. Apperson Jackrabbit, 50-h.p.; Herbert Lytle; Apperson Bros.
2. Isotta Fraschini, 50-h.p.; Louis Strang; J. H. Tyson.
3. American, 50-h.p.; Fred Tone; American Motor Car Co.
4. Lozier, 45-h.p.; Harry Michener; H. A. Lozier.
5. Apperson Jackrabbit, 50-h.p.; W. R. McCulla, Apperson Bros.
6. Isotta Fraschini, 50h.p.; Al. Poole; Isotta Fraschini Import Co.
7. Stearns 4-cylinder, 30-60-h.p.; Frank Leland; Ross Guerrard.
8. Acme 6-cylinder, 45-h.p.; M. A. Neutsteter; Acme Motor Car Co.

Anent the drawing for numbers for this race, there hangs a tale. Edgar Apperson claimed that he had made his entries, and that they were accepted with the understanding that they should be started, respectively, first and last. Though this was clearly against all precedent and contrary to the conditions named on the entry blanks, the other entrants consented, in view of the Apperson's having made the initial entries to the meet to one of their cars starting first, but refused flatly to permit the other to wind up the procession.

In the light runabout class, those with piston displacement of less than 375 cubic inches, excellent sport is looked for. In this are two Thomas-Detroit roadsters, colored blue and designated the "Blue Birds"; a Pennsylvania, an Apperson, a Premier and a Cleveland. Of this group, the Pennsylvania is very fast, having been credited with being timed at as high as a 72-mile gait on the grand stretch.

In the 360-mile race, the eight starters are all on hand, and are doing daily work on the course. In checking over all of these cars, the Technical Board took the measure of the wheelbase, wheels, tires, cylinders, radiators, brakes, frame and springs, and inspected the carburetion, ignition, lubrication, cooling and other parts. Calipers and straight edges were in constant use.

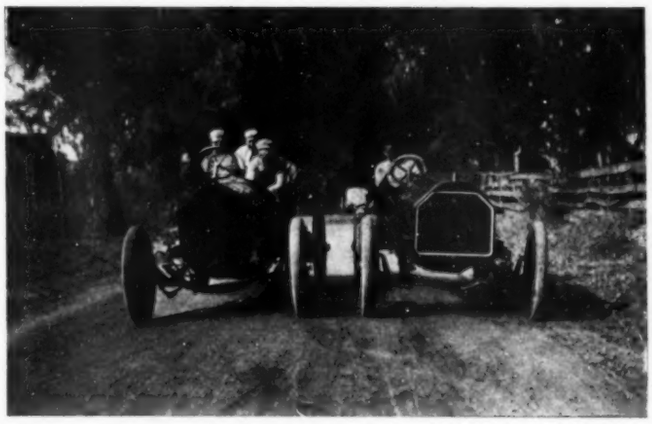
Chairman N. H. Van Sicklen and Vice-Chairman David Beecroft were busy all day Monday inspecting the many competing cars and checking over the various measurements of them, to insure that nothing but stock constructions were allowed. In this little trouble was met with, the majority of the cars carrying every ear mark of the stock machine. Not a little care was taken on the two Isotta Fraschini machines, that have every line of a racing machine. However, the catalogues from Italy show them to be of stock lines, the company having brought out a special line of fast roadster cars.

The six-cylinder Thomas was compelled to take off a 29-gallon cylindrical gasoline tank that was mounted crosswise behind the seat, and to use instead the regulation tank under the seat. The Lozier was ordered to use but one of its 5-gallon oil tanks carried lengthwise on the chassis; one of the Thomas Forty machines had its spring wrapped, which wrapping was removed, but otherwise nothing out of the regular was met with. It is most commendable to think that the makers have taken stock jobs off the shipping room floor and have not tried to win a victory by unfair means.

In the race for cars with a piston displacement of over 575 cubic inches, the probable starters are Thomas and Stearns, the Austin, Matheson, and Gearless not having arrived. The Thomas will start first, and Leland with the Stearns will follow a minute later. Both of these cars are speedy and the result of their meeting is awaited with great interest.

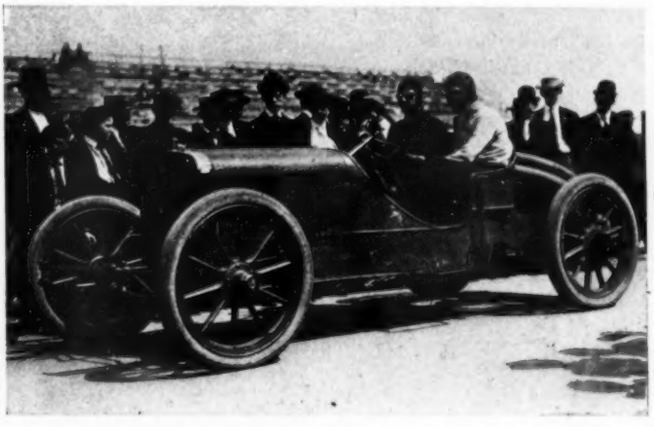
Apperson and Thomas Win First Day's Events.

SAVANNAH, GA., March 18.—Herbert Lytle, driving the 24-horsepower Apperson stock runabout, crossed the line a winner in the 180-mile race for four-cylinder stock runabouts having a maximum piston displacement of 375 cubic inches, which was the opening event of the meet. His time was 3:35:41, the last lap being made in 21:19, while his average speed was about 53 miles an hour. S. B. Lorrimer, in the Thomas Detroit 40-horsepower *Bluebird*, was called off at the end of the ninth lap, having covered 162 miles in 3:36:58, a combination of tire and carbureter trouble having caused the delay and the heavy loss of time.

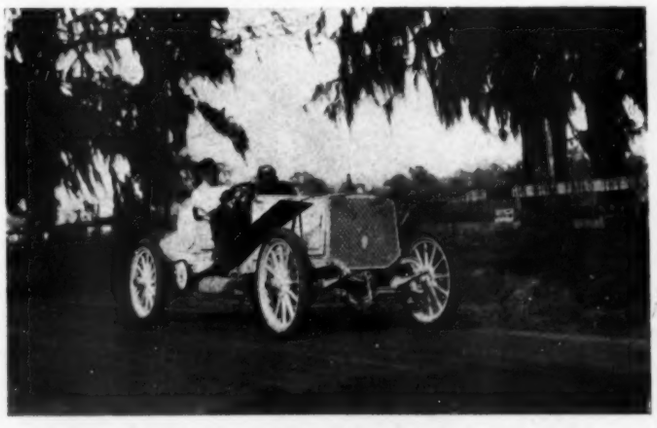


Two Six-cylinder Candidates—Stearns and Thomas.

Beautiful weather was vouchsafed for the curtain-raiser and fully 2,000 spectators occupied the grandstand, which was draped with the national colors and the Three A's banner. The race for runabouts, which was first on the program, originally had four entries, but just before the start word came that the Thomas Detroit, which R. J. May was to drive, had blown out a cylinder head. The trio that started was composed of the 50-horsepower Pennsylvania, driven by L. J. Zengell, which was sent away promptly at 10 o'clock; the Apperson Brothers' 24-horsepower Apperson, driven by Herbert Lytle, which got away at 10:06, and the E. R. Thomas Detroit Company's 40-horsepower Thomas, driven by S. D. Lorrimer, that crossed the line at 10:10. All of the cars got away without hindrance.



The American Entry, with Driver Tone at Wheel.



Pilot Michener at the Wheel of the Lozier.

Mr. Apperson and Secretary Solomon, Savannah A. C.

The Pennsylvania Entry, with Driver Tenck in Command.

The Pennsylvania was looked upon as a general favorite and its performance on the first round verified this opinion, as it completed the lap in 18:54, the Apperson following in 20:29, and the Thomas Detroit in 23:45, actual time. These figures had scarcely been posted when it was announced that the Pennsylvania was out of the race with a broken axle. It was learned later that the trouble lay in the clutch. Carbureter troubles soon began to delay the Thomas, and the Apperson gained steadily, passing Lorrimer in the fifth lap, then stopping for gasoline. A stop was made later to change the spark plugs, these being the only delays, as the Apperson was fortunate enough to encounter no tire trouble whatever.

In the third lap the Thomas lost a tire, so that when the Apperson again entered the running the cars were soon close together and made an exciting race of it, being less than two furlongs apart until the end of the eighth lap, when Lorrimer stopped in front of the grandstand to make carbureter adjustments, losing four minutes. From this point on it was a runaway for the Apperson. Lytle was wildly cheered as he entered the ninth lap, and was given an ovation at the finish, just a few minutes before the Thomas ended its ninth round, and the race was officially declared ended. The progress of the race was as follows:

Laps.	Miles.	Lytle's Time.	Lorrimer's Time.
1	18	20:29	23:45
2	36	40:56	48:06
3	54	1:01:16	1:14:11
4	72	1:21:48	1:41:06
5	90	1:48:30	2:05:03
6	108	2:09:02	2:25:05
7	126	2:29:22	2:49:38
8	144	2:53:26	3:14:47
9	162	3:14:22	3:36:58
10	180	3:35:41	

The running of the Apperson was most consistent, varying between 20 and 21 minutes per round, except on the two rounds in which its stops were made.

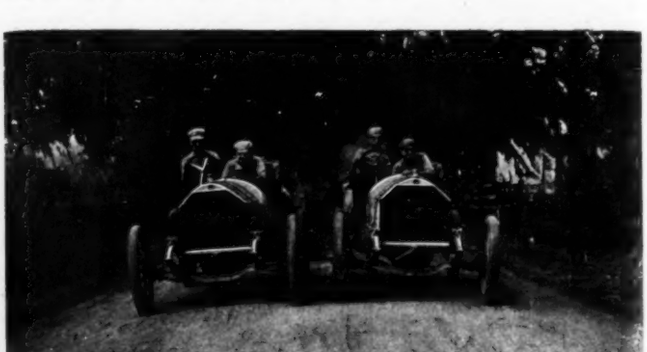
Two six-cylinder cars faced the starter in the 180-mile race for cars of over 575 cubic inches piston displacement—a 70-horsepower Thomas, entered by J. F. Kiser, of Atlanta, and driven by George Salzman, and a 45-90-horsepower Stearns, nominated by E. H. Inman, of Atlanta, and piloted by Frank Leland. It was a splendid race at the start, arousing great enthusiasm. The Stearns completed the first 18-mile circuit in 16:55 and the Thomas in 17:35. On the second round the connecting rod of the Stearns broke, forcing the piston through the crankcase and putting it out of the race.

CADILLAC WON FLORIDA ROAD RACE.

MIAMI, FLA., March 14.—Of the four starters in the road race from Jacksonville, there were but two survivors at the finish. Dr. W. M. Stimson, of Jacksonville, driving a single-cylinder, 10-horsepower Cadillac runabout was the only contestant to finish the 372-mile route laid out by the Cleveland *Pathfinder* in the five days called for by the conditions. A 1905 24-horsepower Peerless, which was chartered to carry the newspaper men and was driven by C. F. Wheeler, arrived here at 4:30 this morning and was awarded second place. Claude Nolan's 10-horsepower, single-cylinder Cadillac runabout was put out of the race yesterday by a broken axle when only 20 miles from here, while Dr. J. H. Pittman, driving a 20-horsepower Buick, gave up at St.

The winner was the only car to get through without a serious mishap to delay it, making the 85-mile run to Ormond in 8:25; the 75 mile stretch to Rock Ledge in 7:28, and a like distance to Fort Pierce in but two minutes more, or 7:30. The 68-mile run to Palm Beach was covered in 10:35, and the remaining 70 miles to Miami in about 4 hours. The Peerless, however, made the 124-mile run from St. Augustine to Rock Ledge in 1 day, 8 hours, 50 minutes, making a new Florida record. It was bogged in a forest near Jupiter for 16 hours the next day and then broke a connecting rod between Palm Beach and Miami.

Driver Price Trying Out His Acme on a Smooth Stretch.



Detroit Thomas Candidates, with Pilots May and Light.

AERONAUTS PROPHESY THE FUTURE OF FLYING

AT their second annual banquet, which was held at the St. Regis Hotel on Saturday evening last, the members of the Aero Club of America were optimistic regarding the future of aeronautical science—in fact, they were confident that its day is already at hand, and that developments will now follow rapidly upon the heels of one another. So rapidly, in fact, that one would hardly be safe in predicting from day to day what will be the outcome of progress a year hence. But the men who know, and they were the ones who spoke, foresee the beginning of an era of aerial navies of both commerce and war within a few years from the present day, and that is thought certain.

"The day is at hand when the balloon is to be supplanted by practical aerial craft. I believe that within the next six months one of our members will produce a dirigible that will astound the world. The opportunity has been provided by the Government, and success, I am confident, will follow. Heretofore, France has led us in this, as with the automobile, but now, I confidently believe, we shall lead the world.

"That's one cup that has gone abroad," continued Mr. Bishop, referring to the victory of the *Pommern* last fall, "but we pledge ourselves that we are going over there and bring it back. We now hope to form all the aero clubs in this country into a federation, which, setting aside every attempt at the mercenary, will aim solely to work for the advancement of aeronautics as a sport and a science. And this result we intend to accomplish."

Many Notable Men, Pioneers in the Field of Inventive Genius, Attended the Aero Club of America's Second Annual Banquet.

"We have now truly entered upon the age of the flying-machine," said Alexander Graham Bell, the veteran of telephone fame, and one of the chief speakers of the evening. "We do not have to produce a heavier than air machine. That has been accomplished. We merely have to improve and perfect that machine just as we did with the automobile. And a short ten years ago the automobile that could encompass the distance of a few blocks was hailed as a marvelous piece of mechanism. Now the automobile can traverse a continent. Its history will be reflected in the perfection of the aerial ship."

Cortland Field Bishop, president of the Aero Club of America, and many of the members of the club, enthusiastically applauded Professor Bell's statements, and several of them, among whom were Hudson Maxim, the inventor of smokeless powder; Major George O. Squier and Lieutenant Frank P. Lahm, of the Signal Corps of the United States Army, spoke in a similarly optimistic vein. "Aeronautics is now recognized as an exact science," was President Bishop's text, "and it cannot be denied that this science is about to give the world a new aspect," he asserted.

He was followed by Mr. Maxim, who was of the opinion that an aerial navy, far from forming an element of unspeakable slaughter, would be one of the most powerful incentives to peace. "The flying machine has become an actuality," he said. "All that remains to be done is to perfect already existing means and apparatus in order to complete the conquest of the air. The application of aerial craft to war cannot be doubted. Their utilization as a war machine will probably give to aeronautics its strongest stimulant. Some terrible things have been predicted for the flying machine as a war engine. Many a sanguine inventor has said that with the advent of his flying machine. battleships, coast fortifications and cities could be destroyed by dropping dynamite from the air. It is comforting to know that no very great loss of life or property would result from this cause, for the reason that dynamite requires confinement to work very wide destruction. Half a ton of dynamite dropped

upon the four-inch deck of a battleship might kill a few men, wreck some of the superstructure and dent the deck a bit, but the destruction would not be widespread and the crew below would be uninjured.

"But a flying-machine will have great use for scouting purposes," continued Mr. Maxim. "The enemy, however, will have his aerial scouts out, too, and there will be many a tilt in the air. Then it will be that speed will count for much, for the machine able to fly highest and fastest will hold the others at its mercy. These aerial craft will serve to maintain the peace of the world."

Professor Willis S. Moore, chief of the United States Weather Bureau, described experiments now under way to procure accurate information regarding the upper strata of the air. "We have sent up our instruments to a height of four miles and more," he said, "and in time we expect to have them ascend at least six miles. At that altitude, we believe we will find that the air conditions remain unchanged throughout each day." Because of the depressed temperature to be found at high altitudes, Mr. Moore thought that buildings of the future may reach heights of 1,000 feet and have summer hotels on the roofs, where heat sufferers may find relief by ascending, either in elevators or aerial craft, and dwelt at some length upon this possible development of the not very distant future.

Major Squier and Lieutenant Lahm contented themselves with tracing the creation of the aeronautic division of the War Department, and outlining the steps which led to the placing of contracts for dirigible machines, the first of the American Government's aerial fleet, the pioneer machine of which will be constructed by Captain Thomas S. Baldwin. McCready Sikes, J. W. Kearney, secretary of the Aero Club of St. Louis, and Johnson Sherrick, president of the Aero Club of Ohio, also spoke briefly. The chief feature of the decorations was a miniature balloon, complete in every detail, which was suspended over the table. Among those present were: Robert W. Chambers, Augustus T. Post, Peter Cooper Hewitt, Arthur Iselen, Ernesto G. Fabbri, Lieutenant Maxwell Murray, Lieutenant T. Selfridge, A. Leo Stevens, Albert C. Triaca, R. Stuyvesant Pierrepont, William E. Whitehouse and James W. Osborne.

FEATURES OF AMERICAN RACER FOR GRAND PRIX

THOUGH not in every detail a stock chassis, the Thomas Flyer which Montague Roberts will drive as the sole American representative in the French Grand Prix July 7 is a much nearer approach to the regular factory output than the majority of racers. The French Derby calls for cars of not more than 6.1 inches bore for four-cylinder engines, and of not less than 2,425 pounds total weight; in all other features constructors are absolutely unfettered. The standard Thomas car, known as the 4-60 Flyer, has a four-cylinder motor of 5 1-2 bore by 5 1-2-inch stroke, obviously too small to compete against the 6.1 by 7.08 foreign racers. On the standard engine base, however, it will be possible to fit cylinders of the maximum bore of 6.1 inches, declares F. P. Nehrbas, superintendent of the E. R. Thomas Company, and this will be the only essential in which the racer will differ from the standard 1908 runabout.

In all probability the engine stroke will not be increased, for this could not be done without altering the entire motor design, and the desire of the factory is to remain as close to stock models as possible. Valve arrangements will be identical with those of the 60-horsepower runabout, inlet and exhaust valves being in pockets on opposite sides, operated by separate camshafts. Bosch high tension magneto will be fitted, with possibly an Atwater-Kent spark generator for use in starting up. Lubrication and engine cooling remain unchanged, the former consisting of mechanical six-sight feed oiler and the other of a centrifugal pump, cellular radiator and two fans. Carbureter will be the Thomas automatic water-jacketed type with auxiliary inlet, the same as is used on the regular output.

Some changes may have to be made in gearing on account of the higher power which the car will develop and also to fit it for the course on which the race will be run. In principle, however, the Grand Prix racer will not differ from the current runabout model. A metallic three-disc clutch will be used, transmission will be of selective sliding gear type, giving four speeds forward and reverse, and final drive will be by side chains. Wheelbase will be 112 1-2 inches. A 36-gallon gasoline tank will be carried in the rear. No decision has yet been made regarding tire equipment for the Grand Prix racer. It is certain, however, that dismountable rims will be employed, the conditions of the race under which every driver has to make all repairs, adjustments, etc., being, in a word, debarred from all outside help—making them essential.

Roberts having returned from the New York-Paris run, work on the car will be pushed ahead rapidly, in order that the racer may be on the course in ample time for the driver to familiarize himself with every turn and grade. No mechanic has yet been selected, the choice, it is declared, resting entirely with Roberts. It is anticipated that the car and its driver will sail for France about the middle of May. Only one racer will be built, but two cars will be sent abroad, the second one to be used in practice work on the course, in order that an unforeseen mishap at the last moment may not ruin the Thomas' chances of competing.

ACTIVE SUMMER PROMISED FOR DETROITERS.

DETROIT, MICH., March 17.—A touch of the real thing in the way of races, endurance contests, economy tests and other stunts is in store for Detroiters, as a result of the action taken by the Detroit Automobile Dealers' Association. This organization, comprising practically all the local retailers, has outlined an ambitious program for the summer. The opener will be a three-day endurance test, not unlike the A. A. A. tour, but shorter. It will be conducted through Michigan alone, and prizes will be awarded those making perfect scores. Following this, there will be other events throughout the summer, calculated to arouse interest in the automobile and demonstrate its ability.

Officers of the Detroit Automobile Dealers' Association for the present year are: President, Alex. I. McLeod; vice-president, J. P. Schneider; secretary, George E. Lane; treasurer, J. H. Brady; directors, the foregoing officers and Charles Grant.

INDIANAPOLIS DEALERS FINALLY ORGANIZE.

INDIANAPOLIS, March 17.—As has been anticipated for some time, local dealers are to form a permanent organization. It will be known as the Indianapolis Automobile Trade Association, and articles of incorporation will be taken out within the next few days. The step was decided upon at a recent meeting of the committee having the coming automobile show in charge. It was recalled that there was no dealers' organization, and that each dealer might be held personally liable for any accidents that might occur that week.

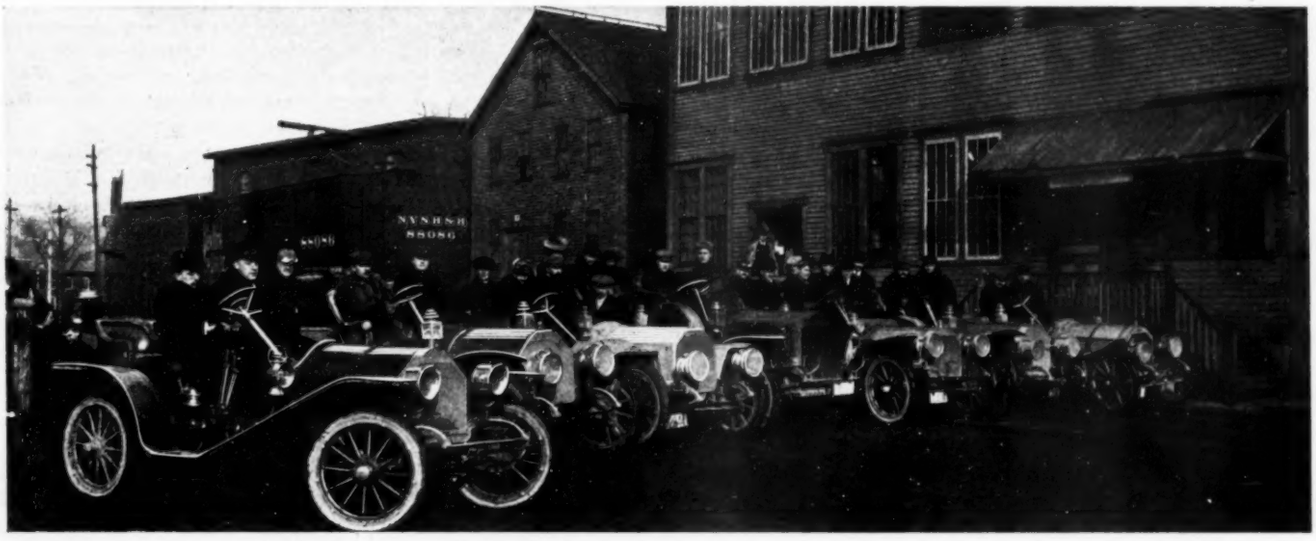
A committee was at once appointed, consisting of Frank Staley, R. I. Eads and C. S. Hicks, to take the matter up and arrange for articles of incorporation. The association in the future will have charge of race meets, shows and contests, and matters of interest to dealers in general will be passed on. The association is expected to benefit the local trade greatly.

SOCIETY OF AUTO ENGINEERS MEET AT THE HUB

THOUGH Boston was down as the meeting place of the first quarterly gathering of the Society of Automobile Engineers this year, one of the chief events of the meeting was the run to Lowell, Mass., for the purpose of inspecting the plant of the Heinze Electric Company, and, incidentally, to partake of a lunch given at the Lowell Country Club, this part of the program having been provided by J. O. Heinze, one of the members. The meeting was opened by President Fay at the Walker Building, Massachusetts Institute of Technology, on Tuesday evening, March 10, with the reading of a paper, entitled, "Perfecting Automobile Ignition," by Mr. Heinze, who supplemented a most interesting talk on automobile ignition by the exhibition of an imposing array of delicate testing instruments of his own invention, with the aid of which he explained the methods he had evolved as the result of a great deal of study, of so standardizing the manufacture of induction coils, that perfect reliance could be placed upon each unit in a coil box having exactly the same characteristics. The Heinze analogue for illustrating ignition advance, showing exactly the amount of lag taking place between the time of closing the circuit and the occurrence of the spark in the cylinder, was warmly commended by many of the engineers, who had never had an opportunity of seeing this important phase of coil ignition so clearly demonstrated. The reading of the paper was followed by the usual discussion in the course of which numerous points of interest came out.

The following morning, at 9:30, the members gathered at the headquarters of the Bay State Automobile Association, where cars were waiting to convey them to Lowell. The official car of the day was a White steamer, and was followed by a Locomobile, driven by A. L. Riker; next came a Berliet, handled by B. D. Gray, chief engineer of the American Locomotive Auto Company of Providence, and following it came a Stoddard-Dayton. Harold Brown, in his Peerless runabout, was the official guide and pacemaker, but found another aspirant for the same honors in the shape of a namesake driving an Apperson "Jackrabbit," and as the result of the competition which arose, the thirty odd miles intervening between Boston and Lowell were covered in little less than an hour and a half, despite the unfavorable condition of a considerable part of the road. J. O. Heinze, in a Marion runabout, met the visitors in Lowell, and piloted them out to the Vesper Country Club, about six miles outside the city, where a luncheon was served to the engineers at Mr. Heinze's invitation and which proved to be a most enjoyable affair.

At the conclusion of this, the members returned to Lowell, and were first taken through the woodworking plant of the Heinze Electric Company, which is situated on the Merrimac river. Every detail of the various processes involved in converting the rough lumber into the highly finished coil boxes was inspected, and then the cars were again taken for the ride to the main plant, where the electrical work is carried on. This is the building shown in the accompanying photograph. It contains a most complete equipment of automatic machine tools for the production of the numerous small brass parts found on vibrating coils, winding, assembling and testing rooms, a battery of mercury air pumps for the manufacture of X-ray tubes, and a laboratory. The various steps in the building of a coil were followed with great interest, but the *pièce de resistance*, so to speak, was the huge induction coil, capable of producing a spark 50 inches in length. It is the largest of its kind ever built, and in action resembles nothing so much as miniature lightning. The secondary winding is in small sections, separated by built-up plates of mica about 1-8 inch thick, while the primary and secondary windings are separated by a heavy micanite tube. It is operated by a circuit breaker of Mr. Heinze's invention.



Members of the Society of Automobile Engineers Upon Their Arrival at the Heinze Electric Company's Plant.

The return to Boston was made without incident, except where the official car, carrying President Fay and Secretary Hayward, was concerned. A combination of tire trouble and lack of foresight on the part of the driver in taking water, supplemented by ignorance of the route, made its passengers about an hour late for the dinner given to the engineers at the Bay State Automobile Association's clubrooms, in Dartmouth street. Prof. F. R. Hutton, past president of the A. S. M. E., spoke at length concerning a proposed plan of co-operation by the two societies, which was enthusiastically received, and referred to the Council of the S. A. E. for further action. The regular business meeting followed this, at which the election held at the annual meeting was ratified and the proposed constitution formally adopted. The remaining papers, entitled, "On the Design and Construction of Crankshafts," by P. M. Heldt; "A Multiple Unit Road Train as the Solution of the Heavy Goods Transportation Problem," by Joseph A. Anglada, and "Forgings for Automobile Work," by R. W. Funk, were then read, the discussion in the case of the last two being postponed. It was decided to hold the third annual summer meeting at Detroit on June 25, 26 and 27, in connection with the meeting of the American Society of Mechanical Engineers.

ENTHUSIASM FOR NEW YORK CARNIVAL WEEK INCREASING

PREPARATORY work of a character destined to make the carnival of the New York Automobile Trade Association the finest thing of its kind ever attempted in automobile circles in this country, has been perfected by the committees in charge, and details are practically complete for the opening of carnival week, on April 6. The trade is supporting the event unanimously, and business houses of all kinds and hotels along the line of march, realizing the importance of the carnival from a business standpoint, have given orders for decorations. A big influx of visitors from out of town is expected.

The parade committee is especially desirous of securing as many cars of 1903 and older as possible. The trade can cooperate in this feature by supplying information regarding the present whereabouts of old cars to R. G. Howell, grand marshal, 1657 Broadway, or Col. K. C. Pardee, chairman parade committee, 317 West Fifty-ninth street.

The special trade run and dinner for Friday afternoon, April 10, will have the Hotel Gramatan, Bronxville, as its objective point. Fuller details, with applications, will be sent to the trade later, for reservations at this dinner.

Judging from the general enthusiasm expressed among members of the trade, the parade will undoubtedly be the biggest feature of the carnival, and will prove a big drawing card with the public. Nearly every one that owns a motor car seems to be anxious to have it in the parade, and it is likely that the committee will have to put a limit on the number of cars in each division of the pageant. Blanks will be issued during the coming week to all persons desiring to enter cars in the parade on the evening of April 7.

The course of the parade has already been decided upon. It will start at Broadway and Fifty-sixth street, in the heart of the automobile district, headed by the cars entered in the Briarcliff trophy race. The various divisions will form in the cross streets west of Broadway as follows:

On Fifty-sixth street—First division, composed of Briarcliff trophy cars, Vanderbilt Cup cars and the historic section of old cars.

On Fifty-fifth street—Second division, composed of dealers' 1908 models.

On Fifty-fourth street—Third division, composed of decorated automobiles.

On Fifty-fourth street—Fourth division, composed of commercial vehicles.

The parade will go south on Broadway to Twenty-fifth street, thence north on Fifth avenue to Fifty-seventh street, to Broadway, north on Broadway to One Hundred and Tenth street and south on Broadway to Columbus Circle, where the paraders will disband. The judges' stand will be on the park strip on Broadway, north of Seventy-third street.

Full swing will be given to the individual fancy in the third, or decorated division, and handsome prizes will be awarded to the cars most beautifully decorated. A special trophy will be offered for the owner who decorates his car most grotesquely. Various firms along Automobile Row are making preparations to decorate the interiors and exteriors of their salesrooms. Many special features of interest are being worked up by the dealers to attract attention to their places of business.

Fort George Hill has been chosen for the hill-climbing contest, which is to be another feature of the carnival. A permit has been obtained from the city authorities for the holding of the climb, either on April 6 or 8. The grade averages more than 11 per cent., and in places reaches 15 per cent. The entry fee will be $10 for each event. The cars will be sent up one at a time from the starting point at the Dyckman street subway station.

AMERICAN CARS WELL REPRESENTED AT TORONTO

TORONTO, ONT., March 16.—Preparations are practically complete for the Automobile and Sportsman's Show, which will open at St. Lawrence Arena, this city, March 21, and continue for one week. The show is attracting the attention of American manufacturers, and more of them than ever before will be represented. The railroads have announced a single rate of fare for the round trip to Toronto from all parts of Ontario. Both the Toronto show and the one to be held at Montreal, April 5-12, are being managed by R. M. Jaffray. The following is a list of the automobile and auto accessories exhibitors:

Automobile & Supply Co., Toronto.
Dominion Automobile Co., Toronto.
Oldsmobile Co., of Canada, Toronto.
Canada Cycle & Motor Co., Toronto.
Ford Motor Co., Toronto and Walkerville.
Hyslop Bros., Ltd., Toronto
McLaughlin Motor Car Co., Oshawa.
C. N. Pierce & Co., Buffalo.
Packard Motor Car Co., Detroit.
Maxwell-Briscoe Motor Co., New York.
Cadillac Motor Car Co., Detroit.
Mitchell Motor Car Co., Racine, Wis.
Stevens-Duryea Co., Chicopee Falls, Mass.
Dayton Motor Car Co., Dayton, O.
Darracq Motor Co., France.
Studebaker Bros. Co., of N. Y., New York.
Renault Frères, France, England.
Napier, S. F. Edge, Ltd., London, England.
Ferro Machine & Foundry Co., Cleveland, O.
Canadian Fairbanks Co., Toronto.
McKeough & Trotter, Chatham.
Schofield-Holden Machine Co., Toronto.
H. E. Gidley Co., Penetang.
N. R. Thompson, Brantford.
Beaudry Gasoline Co., Montreal.
Walter H. Lowney Co., Montreal.
Buffalo Gasoline & Motor Co., Buffalo.
Conboy Carriage Co., Toronto.
Crofton Storage Battery Co., Toronto.
S. F. Bowser Co., Toronto.
Canadian Rubber Co. of Montreal, Toronto.
Diamond Rubber Co., Akron, O.
E. Tenham, Brandon, Wis.
Dunlop Tire & Rubber Goods Co., Toronto.
Nugget Polish Co., Toronto.
Guttapercha Rubber Co., Toronto.
Rubber Tire Wheel Co., Montreal.
Canadian Puncture Proof Tire Co., Toronto.
Geo. A. Haw, New York.
E. P. Hopcroft, Toronto, Polson Iron Works.
Premier Motor Co., Toronto.
Canadian Show Case Co., Toronto.
Randall-Faichney Co., Boston.
Auto Igniter Co., New York.
M. L. Butler, Brighton.
Thrall-Fishbeck Co., Detroit.
Roberts Motor Co., Clyde, O.
Ferro Machine & Foundry Co., Cleveland.
International Carriage Co., Brighton.
Motz Tire Co., New York.
Reo Motor Car Co., Lansing, Mich.
Motz Clincher Co., New York.
Jno. J. Robinson, Toronto.
Comet Motor Car Co., Montreal.
Winton Motor Carriage Co., Cleveland.
Kissel Motor Car Co., Hartford, Wis.
Premier Motor Mfg. Co., Indianapolis.
Royal Motor Car Co., Cleveland.
St. Lawrence Engine Co., Brockville.
Canadian General Electric Co., Toronto.

DESIGN AND CONSTRUCTION OF CRANKSHAFTS*

By P. M. HELDT, Member Society of Automobile Engineers

THE crankshaft of the motor of a modern car is at once one of the most expensive single pieces that enter into the whole construction, and a part that requires the greatest skill of the machinist's art for its proper execution. The crankshaft is an old mechanism, having been in use for over a century, on steam-engines, but the problem of the multiple crankshaft, for high-speed internal combustion engines, is a relatively new one. The abolition of the crankshaft in engines is a hobby with numerous inventors, and during the ten years of the writer's connection with the automobile industry, numerous crankless engines have been brought to his attention. I am inclined to think, however, that a principle of construction which has withstood the test of time for over a century must have unusual merits.

In the design of a crankshaft the first requisite is that it must be strong enough to resist or withstand the stresses to which it is subjected in operation. These stresses are of a very variable and complex nature and almost impossible to determine from theoretical considerations alone. Of course, it is only necessary to consider the maximum stresses for any given portion of the shaft. On the crankpin there is evidently a bending stress which is at a maximum at the moment the explosion occurs. The crank arms are subjected to compound stresses, viz., a bending stress in the plane of the crank and a bending stress in a plane at right angles to the crank. To better understand the first of these

Fig. 1.—Illustrating effect of stresses on crank members.

stresses we may consider the crank stationary in the top dead center position; when the explosion occurs, the pin and crank arms will flex, somewhat similarly as when a load is applied to a beam fixedly supported at its two ends. The flexure in actual work is, of course, infinitesimal, but we may obtain an idea of the general shape the parts assume by considering a shaft of very small cross-sections and long members. When such a crank is subjected to a load corresponding in direction to the pressure of explosion, the crank members will assume approximately the form shown in Fig. 1. I have here assumed that the two shaft journals are held rigidly, while the crankpin is capable of bending. This assumption has some justification because the crankpin bearing is often much shorter than the main bearing. This illustration gives a good idea of the localization of stresses at the joint between the crank arms and the main journals. It is at this point that practically all breaks of crankshafts occur. To minimize the danger of breakage liberal fillets should be provided.

The crank arms act as lever arms for turning the shaft and as such are subjected to bending stresses which increase from the joint with the crankpin to the joint with the main journal. The latter is subjected mainly to torsional stresses.

The crankshaft must be designed to withstand these stresses, and yet must be no larger than necessary, because this would mean not only an amount of dead weight would have to be carried, but that—if the journals were of more than the necessary diameter—the friction loss would be greater than need be. In spite of the fact that there are thus two distinct reasons for keeping down the size of the crankshaft, I do not believe that too much peeling here is advisable. It has been said—and I believe is the general opinion among engineers—that every crankshaft breaks in the course of time, its lease of life depending upon the character of its material and the maximum stress regularly sustained at any point. Experiments with so-called endurance machines have shown that the number of repetitions of stress which a part will withstand is directly dependent upon the value of the stress as compared with the breaking strength of the material; in other words, upon the factor of safety. Now, the aim in crankshaft construction should be to make the maximum unit stress so low that the endurance of the crank equals the normal lease of life of the motor. Breakage of a crankshaft while the motor is still in good working condition will always

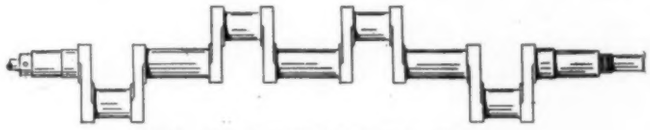


Fig. 2.—Five-bearing type of crankshaft.

be regarded by the owner as proof of improper design or poor material, while there is, of course, no advantage in endurance much beyond the normal lease of life of the motor. But this endurance is not subject to exact calculation and it is far better to err on the side of safety in proportioning the crankshaft. This policy of making the shaft considerably heavier than would seem necessary is followed by the German Daimler Company.

In the production of crankshafts a number of entirely different processes are followed. In some of the old style marine and small stationary motors are found crankshafts which are produced from a piece of machinery steel which has a kink put into it by a steam hammer to serve as the crank, and then has the pin and main journals turned up in the lathe. The manufacturers of these motors claim the advantage that in these shafts the grain runs lengthwise of the shaft. This latter point cannot be advanced in favor of the crankshafts used in the majority of modern high-grade, four-cylinder motors. These shafts are made from solid prismatic slabs of metal of the same dimensions as the over-all dimensions of the completed shaft. "Whittling" a shaft out of such a block of metal entails an enormous amount of machine work and comes very expensive, but is thought to be justified by the very superior metal thus obtained in the finished shaft. The "grain" argument in favor of crankshafts forged to shape, as against those turned from solid slabs, has

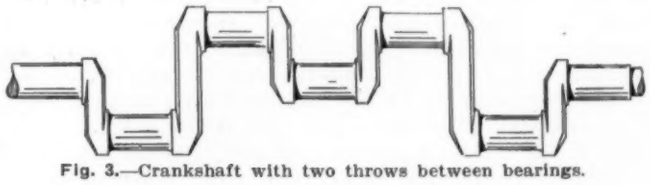


Fig. 3.—Crankshaft with two throws between bearings.

probably very little weight, because metallurgists are now generally leaning toward the opinion that steel is not fibrous at all, but is naturally of a crystalline structure and as strong in one direction as in another. Many crankshafts of modern engines are made from drop forgings and hydraulic forgings, and the advantages of this method of construction are that it greatly reduces the amount of machine work that must be done upon the shaft. In the case of crankshafts for low-priced cars it is the custom to leave the crank arms of drop forged crankshafts in the rough and only to finish the journals. It is really hard to see what advantage there is in finishing the crank arms, except that a crank so finished looks better, but as the crank of an automobile engine can only be seen when the motor is taken apart for repairs, this feature seems to benefit only the repair man. Of course, it is hardly necessary to add that a crankshaft made from a slab must have its arms machine finished.

The materials most largely used for automobile crankshafts

*Paper read before the Society of Automobile Engineers at Boston.

are carbon steel of from 35 to 50 points carbon, nickel steel, nickel chrome steel and vanadium steel. Formerly it was the custom in France, I understand, to case harden the crankshaft journals and grind them. This treatment undoubtedly improves the bearing properties of the steel. The case hardening process has now been given up and instead the shaft is subjected to a heat treatment. In some cases this treatment consists in raising the shaft to a temperature of about 900 degrees Centigrade, quenching it in oil and then reheating it slowly to 500 degrees Centigrade. This treatment is given the shaft after it has been roughed out, for the reason that it hardens the metal and renders the removal of more material difficult.

The treatment given the best results depends, of course, entirely on the particular grade of steel used, and the subject of the different available steels is so vast that it can be only referred to in passing. Whatever grade of steel is used, however, it is essential that it be derived from very pure ingredients and that the sulphur and phosphorus components be as low as possible.

Perhaps the most interesting phase of crankshaft design to the automobile engineer is that of the proportioning of the parts, from the pressures and stresses developed in the engine on the

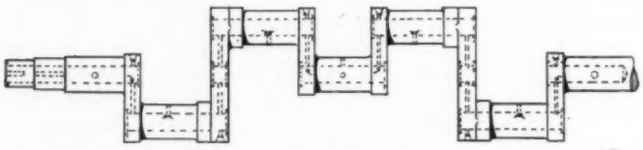


Fig. 4.—Three-bearing crankshaft drilled for lubrication.

one hand, and the strength of the material (generally recommended by a metallurgical engineer) on the other.

For the purpose of this discussion we may divide the different single-piece shafts used in automobile engines into four groups, with one, two, three and four throws between main bearings respectively. The first two of these groups are by far the most common; that type with three throws between main bearings has been used on some small experimental triple-cylinder engines, while the last type with four throws between main bearings is now coming into use for taxicab or "block" engines.

It is at once apparent that in a crankshaft with a main bearing between each pair of throws or at both sides of the crank there is little chance for heavy bending stresses to occur, provided the bearings are rigidly supported by the crank chamber or base. In a crankshaft with a double throw between main bearings, the bending moment is already a much more important factor, because of the greater relative distance between supports. In a crankshaft with four throws between the main bearings the bending moments become a factor of extreme importance.

In a crankshaft of the first type the length of the crankpin and main bearings is limited, and for a certain size of cylinder bore and an average compression figure the crankpin must be of a certain diameter if the specific pressure on the bearing surface is not to exceed the maximum permissible value. If both the diameter and the effective length of the pin are made directly proportional to the cylinder bore, the projected area of the pin bearing will be proportional to the piston area and consequently to the maximum pressure that it will have to support. Some years ago I gathered data of the crankshafts of a large number of American, single-cylinder crankshafts, practically all of ordinary carbon steel and made by the drop forging process. I found that the average proportions were:

Pin diameter $= .3 \times$ bore.
Pin length $= .42 \times$ bore.
Width of crank arm $= 1.4 \times$ pin diameter.
Thickness of crank arm $= .5 \times$ pin diameter.

The material used in these shafts had perhaps an average tensile strength of 65,000-70,000 pounds. If alloy steels of 105,000 to 125,000 pounds tensile strength were substituted the proportions could be materially changed. The crankpin could be made somewhat longer and of smaller diameter, and the arms could be reduced in size in both directions of their cross-sections.

A close calculation of crankshaft dimensions should, of course, take into account both the maximum pressure developed in the cylinder and the tensile strength or elastic limit of the material. It is evident that in a crank with double throws between bearngs the crankpins must be larger in diameter than in a crank with only a single throw between the bearings, of the same material and for the same size of cylinder. The long crank arm in the former case also must be considerably heavier than the short crank arms. From comparatively recent data of a considerable number of four-cylinder crankshafts with double throws between main bearings, I have reached the conclusion that in average practice the pin diameter in such cranks is

$$d = .4\sqrt[4]{\frac{P^2}{S}},$$

where P is the maximum pressure on the piston and S the tensile strength of the crankshaft material. For a crankshaft with only a single throw between main bearings the formula becomes

$$d = .38\sqrt[4]{\frac{P^2}{S}}.$$

The coefficients .4 and .38 may seem to close together that the difference is not worth talking about, but it must be remembered that the strength of a crankpin is proportional to the cube of its diameter, and the former formula gives a pin about 17 per cent. stronger than the latter. The length of the crankpin can be found from the permissible unit bearing pressure and the bearing diameter thus determined. In a crank with two throws between main bearings there is no reason why the bearings should not be made comparatively long, as there is plenty of room, and the unit bearing pressure may be limited to 1,200 pounds per square inch. In the other type of crank the space is limited and the unit pressure on the crankpin bearing surface must be carried somewhat higher, 1,500 pounds per square inch being an average figure.

The proper diameter of the main journals is, of course, the same for all types of crankshafts. The resistance to torsion of the main journal must be proportional to the maximum pressure on the piston and to the length of the stroke. I have found the

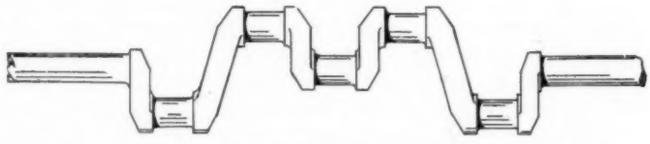


Fig. 5.—A variation of the three-bearing type of crankshaft.

following formula to express very closely the average practice in dimensioning the main journals:

$$d = 2.6\sqrt[3]{\frac{sP}{S}}.$$

In proportioning the crank arms it is usual to make the width somewhat greater than the crankpin and main journal diameters in order that it may provide a shoulder for the bearings, the average width being $w = 4/3 \times$ crank-journal diameter. When this width is used the average thickness of short crank arms is given by the formula

$$t = \frac{d^3}{w^2}$$

and that for long crank arms by the formula

$$t = .72\sqrt[2]{\frac{d^3}{w}}.$$

This practice of making the crank arms equal in width to the crankshaft diameter plus about twice the height of the flanges on the ends of the journal sleeves is a heritage from the period

of single-cylinder engines. There can be little doubt that in a crankshaft with two or more throws between main bearings advantages in the way of lightness and strength could be secured by making at least the long arms narrower and of somewhat greater thickness. This idea has been carried out in some crankshafts made of drop forgings and in which the arms remain unfinished. In these shafts the crank arms are forked with segmental prominences on opposite sides of each journal, so as to form a complete circular shoulder the height of the journal sleeve flange. In shafts finished all over it is, of course, impossible to provide these prominences, but it does not seem at all necessary that there should be a continuous circular shoulder at the end of each journal, as, unless no provision is made to take the end thrust of the clutch up within the clutch itself, there is little end pressure on the bearings of a crankshaft.

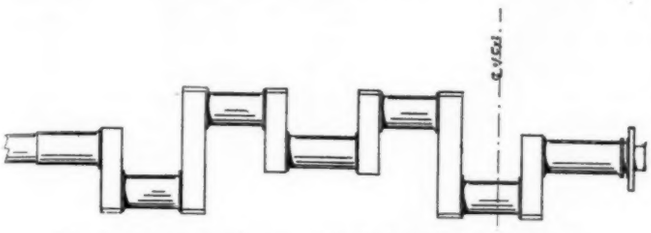


Fig. 6.—Three-bearing crankshaft longitudinally offset.

Certainly the most striking and daring innovation in crankshaft design is the four-cylinder crankshaft with only two main bearings, as used on a number of "block" motors fitted on taxicabs. When one considers that in a single-cylinder engine the average distance between main bearings is only about seven-eighths of the cylinder bore, while in a four-cylinder "block" engine with only two main crank bearings it is at least four times the cylinder bore, it can easily be realized that the bending moment on the shaft at the moment of explosion is relatively great. Of course, it is possible to make the shaft so heavy that the unit stress will be quite reasonable, but it is desirable to keep the dimensions down, not only because of the saving in weight thus effected, but also because there is less friction loss.

It is hardly likely that a shaft of this type will be made of carbon steel, with its relatively low elastic limit; nickel steel and chrome nickel steel are undoubtedly essential to stand the strains imposed on a crankshaft of this type for a period of time approaching the life of the engine. It is also obvious that with a crankshaft of this kind considerable bending will occur at the moment of explosion, and care must be taken in the design to insure that there can be no localization of strains from this bending. With only two bearings, if plain or parallel bearings were used, they would necessarily have to be of more than the usual length, and the two ends of the shaft would be almost rigidly held, so far as bending is concerned. This would concentrate the strains at the inner ends of the main journals, and the shafts would undoubtedly break at these points in short order. Some form of bearing which permits of some disalignment of the journal portion of the shaft appears to be absolutely necessary. The annular type of ball-bearing fulfills this requirement and seems to be exclusively used for the purpose at present. Some sort of parallel bearing with a spherical seat, as often used on dynamos, might possibly also be made to serve the purpose, but would hardly be as good as the ball-bearing. Localization of strains at the ends of the crankshaft journals is also a serious matter in crankshafts with less than four throws between supports, and probably a majority of all crankshaft breaks occur at these points. That this danger must be guarded against by providing fillets of large radius at the junction of journal and crank arm can be read in almost every article on crankshafts, but is one of those important rules of design that will bear repetition.

One of the illustrations herewith shows the crankshaft of the Delahaye 12/16-horsepower block motor, which is probably typical of this design of crankshaft. In studying the layout of this shaft it will be observed that it is not in perfect mechanical balance, there being nothing below the center line of the shaft in the drawing to balance the two short crank arms extending upward. It would, of course, be an easy matter to secure counterweights to these outer crank arms, but in the writer's opinion a more advantageous plan would be to increase the cross-section toward the middle of the shaft. The two long crank arms would then be slightly tapered from one end toward the other, and the two middle crankpins would be of larger diameter than the two outer ones. This latter feature, necessitating two different designs of connecting rod bearings, and possibly of connecting rods, would be the reverse of an advantage, but otherwise the construction would have at least two advantages. The bending moment in a structure like this increases from the ends towards the middle, and in order to reduce the unit stress to a minimum, with a given weight of metal, the section must increase from the ends towards the middle. Further, if the two inner crankpins are heavier than the two outer ones and the long crank arms taper from the inner to the outer ones, the shaft might be made to balance perfectly without extra balance-weights.

In connection with the question of balancing four-cylinder crankshafts, the point is sometimes made that if cranks extending in opposite directions from the shaft and located at some distance from one another in the lengthwise direction of the shaft are depended upon to balance or neutralize one another's centrifugal and inertia effects, this can only be accomplished at the expense of internal strains in the shaft, and it is contended that the only proper way to balance a four-cylinder shaft is to provide each short crank arm with a counterweight extending in the opposite direction. This idea is carried out in at least one French engine. The writer believes it to be an illusory refinement, as the increase in weight is a much greater detriment than the strain on the shaft due to the balancing effect of sidewardly displaced opposite cranks.

If the four-cylinder, two-bearing crankshaft should prove a permanent success it would mean an important simplification in engine construction. Doing away with the standards for intermediate bearings, and with these bearings themselves, it would lead to a considerable saving in the weight of the crankcase. The weight of the crankshaft itself would probably be not very much more than that of an equivalent crankshaft of one of the two usual types, because the greater necessary cross-section of the shaft parts would be partly compensated for by the simpler form (fewer members). The saving in the work of machining the crankshaft and fitting the bearings would be an important item. It is the writer's belief that for the best distribution of metal in a shaft of this kind the section of the two long arms should be nearly square. As to the ultimate success of this form of crankshaft, only continued experience can tell, and it would be a waste of time to seek to argue this question, as it is probably not so much a question of strength as of weight.

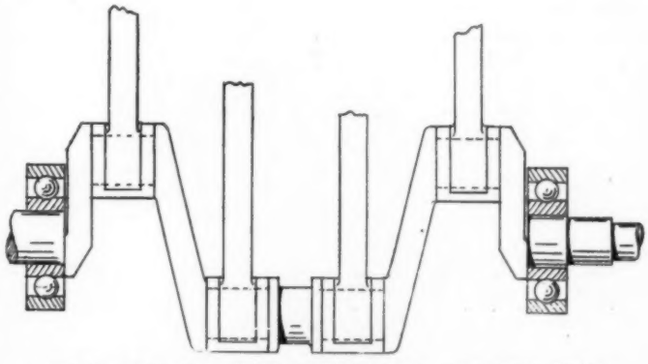


Fig. 7.—The most recent development in crankshaft design.

The accompanying cuts illustrate crankshafts of 1907 and 1908 models of American four-cylinder engines, which show a considerable variety in design.

APPARATUS FOR THE STUDY OF AUTO SUSPENSION*

IN repose, the reactions of an automobile on the passenger are the equal and directly opposed result of his weight P. Generally speaking, they are not quite the same while the car is in motion. As the result of the oscillations due to the irregularities of the road, the center of gravity of the passenger describes a curve, more or less erratic, about a line parallel with the surface of the ground traveled over. Let it be assumed, for greater simplicity, that the chassis remains parallel to itself during its movement, designating γ as the value of its acceleration. The resultant of the reactions of the car on the passenger then no longer constitute a vertical force equal to P and constant, but a variable vertical force as γ, of which the valre is:

$$P\left(1 \pm \frac{\gamma}{g}\right), \quad g = 9.8088$$

the $+$ sign corresponding to ascending movements of the chassis, and the $-$ sign to descending movements. It will be apparent that these are the cause of the fatigue of the passenger.

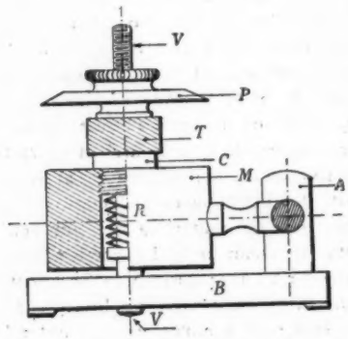


Fig. 1.—Part sectional elevation of device.

Instead of being able to permit his muscles to remain in repose in a state of tension corresponding to the action of the force P, which is their normal state, he must accommodate them to the state of tension corresponding to the action of the constantly variable force:

$$P\left(1 \pm \frac{\gamma}{g}\right).$$

It will be apparent that the fatigue resulting from this continuous strain is proportionately greater, as the amplitude of the variations of that force, and in consequence the maximum value of γ, is greater. What is true of the fatigue of the passenger, applies with equal force, taking the mechanical signification of the word, to every stress of the chassis and the carriage work. A low maximum value of γ is therefore an essential element of comfortable riding and of durability in the car and each one of its parts.

In the accompanying illustration, Fig. 1, let it be assumed that the body of the mass M, attached at a point on the chassis by means of a vertical fastening, of which the tension in repose is represented by F. Then when the acceleration of the vehicle is equal to the tension F becomes $F \pm M$, in such a manner that the measure of γ is reduced to the measure of the variation of the tension F. The following is a description of the manner in which M. Boyer-Guillon, head of one of the departments of the laboratory of the Automobile Club of France, and myself, have applied this principle to the construction of an apparatus for the experimental study of automobile suspensions. The body of the mass M is a cylindrical weight which may be caused to oscillate about an axis AA, perpendicular to a second axis as shown. The apparatus is arranged in such a manner that the center of gravity of the weight M falls upon this second axis, as shown in the plan view, Fig. 2, and in the horizontal plane of the axis AA, as shown.

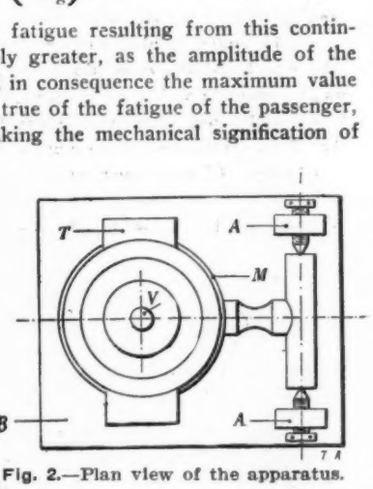


Fig. 2.—Plan view of the apparatus.

*Translation from "La Technique Automobile," by C. B. Hayward.

The weight M is drilled to form a cylindrical cavity in which may be mounted the indicating spring R. The other end of this spring carries the stem VV, which runs through the weight M, and is guided by the frame which carries the entire apparatus and by the transverse piece T. This stem runs through the weight M without coming in contact with it at any point, and its upper end is provided with a milled screw which tightens up against T. The weight M is pressed upward by the action of the spring and rests against the washer C, fixed to the transverse piece T. In using the instrument, turning the milled screw down draws the stem VV upward, and, as a result, compresses the spring, thus applying the weight M against its stop with more and more force. The screw P carries a drum on which is marked a scale, permitting of the accurate measurement of the compression of the spring R, as the screw is turned up or down, and in consequence affords a means of ascertaining the pressure of the weight M against C, which is the difference of the tension of the spring R, and the weight M. The pressure p may be likened to the tension of the fastening of the weight to the chassis, which, as already mentioned, has been given as F.

With the aid of an electric current, it is possible to observe with considerable precision by means of the interruption and reestablishment of the contact, the moment that M is separated from its stop. At that instant, the variation of the tension is precisely p, and as a consequence, the value of the acceleration of the chassis may be determined. The apparatus is employed in the following manner. It is attached to a point on a car placed upon the drums of a testing machine, or run over a surface upon which have been arranged obstacles of a predetermined height and profile. The screw P is regulated to a nicety to the point where the weight M separates from its stop upon passing over these obstacles. The tension of the spring is then taken. By this means, it is possible to determine the maximum value of the acceleration of the chassis on passing over a known obstacle, and the characteristic value of the method of suspension of the car.

AUTOMATIC CARBURETERS AND FUEL TESTS.

When fashion decides that the carbureter of every automobile, regardless of type, shall be equipped with a carbureter without hand adjusting gear on it and that shall provide a constant and uniform, homogeneous mixture, whatever may be the speed of the motor, as it is put in the catalogues, the innovation will certainly be favorably received, because it will mark the end of an annoying subjection to this part, says Pol Ravigneaux in *La Technique Automobile*. So-called automatic carbureters flourish, but they are a debauch of diaphragms, slides and valves, designed to make up for the deficiency in skill of the hands of their users. In fact, the greater parts of the present carbureters, simple or complicated, crude or otherwise, give sufficiently good results, but somewhat to the detriment of economy. It is necessary that they automatically take care of the speed of the motor and in this they acquit themselves well, but this is not sufficient. They should do this with the best possible results in economy, and things are far from this stage at present.

Now that economy tests are the order of the day the almost unanimous return to the non-automatic carbureter may be remarked, or at least the addition of a supplementary air slide. The latter is susceptible in the hands of a good driver of giving excellent results. It may be asked if this addition is not a step toward an evolution contrary to the present trend of progress, for it cannot be denied that the automatic carbureter, on the score of simplicity, is not a great step forward. As the result of such economy tests as that afforded by international races of which the Grand Prix of the A. C. F. is an instance, there should be great progress made.

MOTOR TROUBLES AND HOW TO OVERCOME THEM

By ARTHUR H. DENISON.

THERE is no doubt that the modern gas engine is capable of making a great deal of trouble for its operators. It is also a well-known fact that trouble of the simplest form is usually the hardest to locate, unless certain precautions are taken. A general rule, covering the majority of forms of trouble found in the everyday use of the car, may be expressed thus: "The simpler matters seem, the worse they are," and vice versa.

A motor will never give trouble while running without also giving very plain indications of what is ailing it. As an illustration: If a person steps to a lighted gas jet and slowly shuts off the supply of gas, he may observe the effect on the flame, noticing it slowly shrink in size as the pressure of gas is reduced and when the supply is shut off the flame will die away. It follows, therefore, that if the same person was sitting in a room lighted by a single gas jet, and the light began to grow dim, he would look at the source of light. If the flame had shrunk, similar to that in his experiment, he would come to the conclusion, without need for further reasoning, that the supply of gas had failed.

Thus it is with our motor, with the difference that the phenomena present must be interpreted by the ear instead of the eye. The modern owner, looking after and making a close study of his car, will do well to consider just how the car or motor acted previous to "giving up," and not jumping instantly to the conclusion that the carbureter is in need of adjustment, or that the man that built the motor didn't know his business. Motor troubles are simply the motor's methods of protesting against working under unfavorable conditions. When trouble of any kind has been located and repaired, either on the road or by the garage repairman, the operator or owner should have the trouble traced backward to the cause and forward to the effect, satisfying himself of the relations between cause and effect, or how the cause could produce such an effect. In the majority of cases, many things not directly connected with the cause must be considered.

To illustrate this, let us consider a motor that is backfiring through the carbureter. This trouble, when not understood, is usually very alarming to those witnessing it. This would seem to indicate at once carbureter trouble, but a knowledge of the car is again essential. Our first step is to determine what condition of the cylinder and its inside arrangements will allow sufficient gas at a temperature high enough to ignite the incoming gas on the suction stroke, remaining after the exhaust stroke has been completed and the exhaust valve closed. There is only one reason which can cause this to take place, and that is the slow burning of the gas during the previous power stroke, consequently combustion is not nearly complete when the exhaust valve opens. The result seems to be that the exhaust stroke does not completely clear the cylinder, partly due to back pressure from gas expanding in the exhaust manifold. The vapor remaining is in the course of combustion, and when the inlet valve opens, allowing fresh gas to enter, the temperature is still sufficiently high to ignite the fresh gas, the wave of flame passing through the open valve manifold and finally blowing out through the air inlet. There is no danger of the gasoline in the standpipes catching fire, as the flame passes them at a speed possibly much higher than 1-100 of a second per foot. If fire did happen, the suction stroke following close would extinguish the slight flame.

Locate the Cause and Then Seek the Reason.

With conditions found, we must next find reasons. The spark plugs will be very sooty. If the car is equipped with jump spark battery ignition, the possibilities are that the vibrators are badly in need of attention or the batteries exhausted. If the car be fitted with low tension magneto ignition, the location of the trouble is almost sure to be in the carbureter, and an examination of that organ should reveal trouble with the auxiliary air inlet, or some dirt in the spray nozzles, preventing a free flow of gasoline. A dirty carbureter, or opening the throttle quickly on any motor, is liable to cause backfiring. The remedy in either cause is obvious—adjust the tremblers, recharge or renew the batteries, or clean the carbureter. If the carbureter is of the adjustable needle valve type, the manufacturer should, after testing and setting it, provide a method of quickly determining whether the adjustment is near the correct point—as determined in the original tests. If the manufacturers have neglected this, the owner or operator should mark it himself.

In one of our experiments the action of the motor gave us a good indication of where our trouble was. Some one

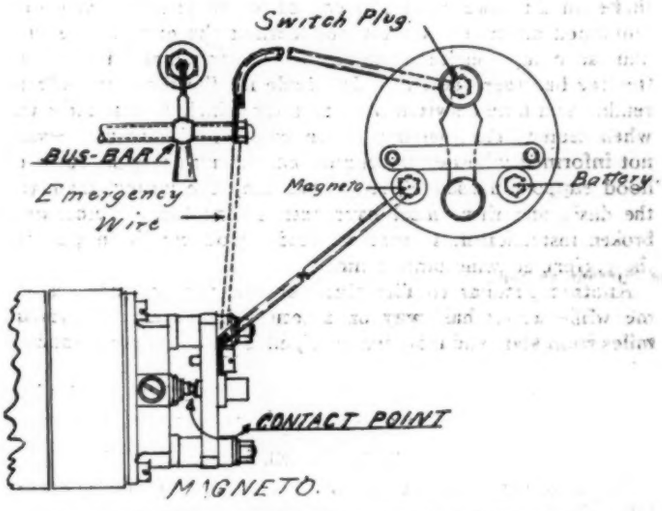


Diagram Showing Experiment to Locate Ignition Trouble.

may ask: "Well, supposing a motor, running smoothly, suddenly stops firing; have you any indication of its trouble in that case?" The answer is simple. If we break the electrical connection by turning the switch, how does the motor act? Therefore, hunt for a broken wire or permanent short-circuit of the primary wiring connections. Cause and effect are traced very easily there. On the other hand, troubles may come and disappear of their own accord, and others may come and we overcome them without having any more knowledge at the end than at the beginning. It is only by intelligently attacking each difficulty and making ourselves as familiar as possible with the conditions under which our motors work, and refuse to work, that we can expect reasonable satisfaction from this performance. In the following accounts the troubles belong to the list that cannot be traced, and the motor's performance did not aid us any.

Typical Instances of Mysterious but Simple Causes.

While road testing the Excelsior cars last year, I brought a car back to the factory one day, the motor running very well. I stopped the motor, letting it stand for about half an hour, and when I tried to start it up again it would not give a sign of an explosion. It was equipped with low-tension ignition and magneto. Thinking that there might be a short-circuited plug, I tried cutting out each cylinder successively, then two at a time, but this did not help me. The

timing of the magneto was next examined and found correct, and in order to eliminate trouble in the wiring or switch, I ran a wire directly from the magneto to the bus-bar (see sketch.) This didn't aid matters. Then I sent for a testing magneto to ring out both connections and magneto. One test seemed to indicate a short-circuit in the magneto and the next nothing wrong. Next, I got a set of dry cells and coil, connected them on to the other side of the switch and the motor started readily, when cranked, but refused to run on the magneto. Finally, one of the other testers, who had been assisting, had taken out the carbon brush that was pressing against a collecting ring which has attached to it the ground end of the armature winding completing the ignition circuit. The carbon was found very dirty and foul. It was cleaned out, and a little gasoline squirted in to clean the brush holder, replaced, the motor cranked and it started readily. The cause of the trouble here is rather obscure, but it is probable that a little speck of dirt held the brush off contact. Other influences, such as the fact that the current from the magneto will overcome a certain amount of resistance, etc., were valueless; that motor wouldn't start.

Later, one of the other testers was bothered with trouble rather similar to the above that defied, for nearly an hour, all his efforts to locate it. The car, of the same make, was fully equipped and party were touring when the engine died in a narrow road in such a place that both the road and a suburban trolley line were tied up. He made all the tests possible to make on the road, as described above, including a close examination of the switch and connections, without any result, and, as a last resource, connected the magneto directly to the bus-bar (see sketch). On cranking the motor it started readily and a new switch overcame the trouble. The old one, when tested later, seemed to be in good condition. I was not informed whether the motor was rewired or not, but the hood support passed directly over the connections through the dash, and there must have been a leak there. Otherwise broken insulation must have provided a path for the escape of the current at some other point.

Another peculiar trouble that I cannot explain occurred to me while about half way on a long trip—about a hundred miles from start and from finish. Cylinder No. 1—front—started to miss irregularly while traveling up a very slight grade. It rapidly became worse, and I tried rocking the spark lever sharply up and down its quadrant. Retarding the spark finally seemed to help it a little—for a distance measured most conveniently in feet. With make-and-break ignition, the armature of the magneto was set 1-32 inch past center with igniters fully advanced. The motor seeming to improve by retarding the spark appeared to indicate a leaky plug, so I stopped and changed it, putting in a new one and resetting the hammer at the same time. The motor ran good for about one hundred yards when the performance began again, exactly similar to the first symptoms of trouble. I stopped again, took out the plug, and examined it, replaced it, and examined carefully the exterior mechanism of the igniter to see if there was any possibility of its sticking or binding anywhere.

Sit Down and Reason Things Out Leisurely.

Everything seemed right, and on starting the motor it ran good for a hundred yards or so again, then started to miss. I stopped and then took out the complete igniter—both hammer and plug or anvil. Both still looked very good, the hammer working freely in its bushing and the head showing so little the pitting action of the spark that I didn't consider it possible to have trouble there. While considering matters, I picked up a file and dressed the head a little, and having done all I could think of, put things back carefully and started the motor. The next time I had occasion to touch the igniter was after 1,500 miles had been traveled. What action or combination of factors cured that trouble I cannot say, for the reason that I have seen hammers and plugs both pitted 1-8 inch deep, firing well.

These three accounts may help bear out my statement that the simpler matters seem, the worse they are. As in the first instance, a dead motor is liable to make things more difficult than if the motor was running until stopped by or gave other indications of trouble. Should you who read them be stopped on the road this Spring with trouble that eludes you, sit down on anything convenient and spend five minutes in thoughtful consideration. It may save you an hour's work, and it will certainly save your temper and patience more than aimless fussing.

AS H. H. FRANKLIN SIZES UP OUTLOOK.

By H. H. FRANKLIN.

"A luxury and the first to suffer," was said of the automobile when the panic came. It made the thoughtful maker of automobiles "sit up and take notice," and those who were able to appreciate the significance of business conditions then are the ones who are now reaping, and will reap, the benefit of their foresight.

The panic through which we have been passing has tended to reduce extravagance and useless expenditure. Owners of automobiles have studied the situation; new buyers are investigating, and some, indeed, refuse to buy at all. The wealthy man who was going to put a large price into a large machine is looking for something costing less, and likewise the man with less money is more cautious, but sales are being made, and more sales will be made.

The question is, "What will be in demand?" When the financial stringency began, it appeared to me that automobiles of medium price and medium size would suffer the least, and that as the Franklins were in that class and also light in weight, and very economical, our company would continue to do a large business. What happened? Our sales in November were $38,142 more than in November, 1906. Sales for December were $46,373 more than in December, 1906. While January sales showed no increase, they equaled December sales, and in February the shipping orders are coming in at an average daily rate of 35 per cent. over the daily rate of January.

ERRORS IN REASSEMBLING NOT UNCOMMON.

It is not an altogether unknown thing for the best paid mechanics and foremen to get things together wrong when reassembling a car, so it naturally follows that the amateur may readily commit similar sins. In one case the omission of a small part of the carbureter permitted the latter to function after a manner and many blind trails were followed before the true cause of the trouble was discovered. This applies particularly to the auxiliary air inlet valve. The latter is rather a ticklish piece of mechanism and one to which the maxim about letting well enough alone applies with all its force, so that it may readily be imagined that failure to assemble correctly would not be apt to improve matters to any great extent.

Sometimes the manufacturer is guilty of an error in the original assembling, but with the painstaking methods of testing cars that have come into vogue, the occasions on which such mistakes can escape the fine-tooth comb process of inspection and trial to which every part of the car is put must be rare indeed. It is the repairman who is most often at fault, and as the majority of cars, though seemingly very much alike, differ more or less in detail, the assembler is often prone to put things back on the car according to preconceived notions of his own as to the way they should go rather than according to the manner originally intended for them by the designer of the car. Of course, this does not apply to the carbureter alone, but to practically every part of the car with which the repairman has to do.

LETTERS INTERESTING AND INSTRUCTIVE

PUTTING IN A NEW PROPELLER SHAFT.

Editor THE AUTOMOBILE:

[1,232.]—Will you please tell me how I can do away with the rear universal joint on a shaft-driven steam car—no change speed or clutch? The shaft between the rear universal and rear axle is about 9 inches long, running in a brass bearing. This bearing soon wears, allowing the shaft to jump, especially when running slow or turning. If possible, I would like to put in a solid shaft with the one universal and slip joint at the engine. C. H. HOYT.

Jefferson, Ore.

Without further details than you supply in your letter it is rather difficult to advise you definitely on this point. We should think, however, that unless the arrangement at the rear axle you speak of is altered you will have this trouble regardless of the situation of the single universal. As at present arranged this bearing receives all the angular thrust of the universal, which accounts for its rapid wear. Why not place the rear universal as close as possible to the bevel driving pinion, thus doing away with the 9-inch shaft you speak of? That is, instead of the 9-inch shaft and its brass bearing, substitute an annular ball-bearing of the thrust type and place the universal directly forward of this. Or, as suggested, the universal and slip-joint might be placed directly back of the engine. If the shaft between the engine and the rear axle is very long, we should not advise the use of a single universal at the forward end, but would prefer two.

ABOUT RENEWING OLD DRY CELLS.

Editor THE AUTOMOBILE:

[1,233.]—In the January 23 issue of "The Automobile" L. M. Lowe, M.D., writes regarding the renewing of "Dry Batteries." We have a preparation which we use to renew old dry batteries, and it works O. K. We have made the following test: We have an electric engine which requires three new dry batteries to turn it over and four to run it at a moderate speed. We took six batteries, which before being treated with our solution were perfectly dead, and they ran the engine at about the same speed as the four new ones. The cost of renewing old cells by our method is very low—one cent or less per cell. SELFE & WHITEFORD.

Darlington, Md.

It is a matter of common knowledge that certain alkaline solutions such as salt and water, sal ammoniac and water, or vinegar and water, can be used to rejuvenate an apparently exhausted dry cell, but that the extra period of life thus obtainable is very short. We do not wish to cast any doubt on the correctness of your tests, but are willing to be shown, first, that the cells on which the solution was tried were absolutely exhausted beyond any possibility of recuperation by standing on open circuit, and, second, that when thus treated they produced an amount of current, or were good for an additional period of activity sufficient to make it worth while to thus treat them.

GEARING ATTACHMENTS FOR FARM IMPLEMENTS.

Editor THE AUTOMOBILE:

[1,234.]—Have you any attachments for gearing a wagon with a gasoline engine, so I can run a wagon, a plow, or a harrow, or do general farming with? Or where can I get them?

Frederick, Okla. JAMES CLAIR.

We do not make or sell automobiles or parts and cannot inform you offhand just where you can obtain the equipment you have need of. However, there are numerous manufacturers who make a specialty of such things and we have no doubt that immediately your letter comes to their attention through its publication in THE AUTOMOBILE they will correspond with you direct. Many farmers buy a clutch such as is ordinarily used on stationary gas engines, a pair of common sprockets and chains and rig their wagons up themselves, as this is not a very difficult matter for anyone at all handy with tools.

EFFECT OF LENGTHENING THE STROKE.

Editor THE AUTOMOBILE:

[1,235.]—In reply to Mr. Frost's inquiry, No. 1,206, you say that "both the power and the efficiency of an internal combustion motor are increased by lengthening the stroke." While this statement is all right as to power, for the simple reason that power is the product of time, distance and resistance overcome, I do not think it is correct as to efficiency, at least in the ordinary type of explosion motor.

Efficiency depends upon the number of expansions attained by the charge, that is, the ratio of combustion volume (clearance) to stroke volume, and as the minimum relative volume of the combustion space is determined by the point at which preignition occurs from compression heat, or, in other words, is in a substantially constant ratio to the stroke volume, it follows that if the stroke be lengthened, the combustion space must be lengthened in the same ratio. Therefore there will be no gain in efficiency in a long-stroke engine unless it be in a slight degree, owing to the changed ratio of cooling surface in the combustion chamber, although this is problematical, because of certain factors having to do with the relative cooling power of cylinder-walls and piston-head.

I think it will be found that the principal reason why stationary engines have longer strokes is that their builders desire to get power at low speed (i.e. number of revolutions per minute), are not limited as to length and weight of engine, and have sought maximum durability. If one should attempt to increase the stroke of an engine having a given bore, and retain the same speed as before in the effort to increase the power, he would probably encounter some difficulties in the matter of increased inertia and centrifugal effects, besides the augmenting of length and weight.

That the efficiency of an explosion engine can nevertheless be considerably increased and a cooler engine secured by the simple expedient of charge-rejection during the early part of the compression stroke, is a fact which it is surprising to find is not more generally taken advantage of by four-cycle engine builders, although it has long been known, being embodied, for example, in the French Charon stationary engine.

To take care of the rejected portion of the charge in a single-cylinder engine involves some complication, but with multiple cylinders, and especially four and six cylinder combinations, the rejected portion simply goes back through the inlet manifold to the next cylinder, which is drawing in a charge, there being, therefore, no back-flow out of the carbureter, and the only change involved over present designs is a longer arc on the admission cams and a smaller combustion space. Such an engine would gain economy by expanding to a greater volume than that from which it begins to compress, its combustion space would have less radiating surface and involve better exhaust displacement, the engine would run cooler because of greater cooling by useful expansion, and the exhaust pressure would be reduced, with consequent less necessity for muffling and back-pressure. The inlet manifold is also kept warmer and complete vaporization of fuel promoted.

The specific power per unit weight of such an engine would probably be as great as or greater than present ones, and its maximum compression could be somewhat increased because beginning nearer the dead-center point. I feel confident that if engines were constructed on this principle, air-cooling would experience a considerable rise in popularity. Makers could then advertise their engines with perfect candor as being "internally cooled."

New York City. R. M. PIERSON.

We do not agree with you in the statement that lengthening the stroke does not increase the efficiency, and think you go wrong on the assumption that lengthening the stroke necessarily means shortening or lengthening the combustion chamber proportionately. If we have a motor with a 6-inch stroke and a 2-inch combustion chamber, a similar motor can be designed with a 7 or 7 1-2-inch stroke and a 2-inch combustion chamber, and in operation it will expand the same volume from the same initial and explosive pressure, down to a much lower terminal pressure than would be the case where the stroke is only six inches. Short-stroke automobile motors exhaust at terminal pressures as high as 40 to 50 pounds per square inch, while stationary motors of good design get as low as 10 to 15 pounds per square inch terminal pressure. The utilization of the difference in pressure mentioned makes for greater efficiency and is brought about directly by the increase in the stroke.

Long stroke motors are necessarily of the slow-speed type, but this and amply proportioned parts make for durability, as a stationary engine is usually designed to work ten or twelve hours a day and about 300 days in the year with a minimum of attention. The gain in power and efficiency is naturally offset to a slight degree by the increased radiating surface presented to the hot gases. Altering the dimensions of the motor as outlined above would increase the ratio of stroke volume, or piston displacement, to combustion volume, and would necessarily permit of a greater expansion of the same volume of charge, on which our contention of increased efficiency is based. The question of pre-ignition need not be a serious deterrent factor in lengthening the stroke, as it is possible to keep the compression within safe limits by regulating the volume of fuel admitted.

We find your description of the Charon stationary motor interesting, and doubtless further work along this line may prove one of the developments of the future.

EFFICIENCIES OF STEAM AND GASOLINE.

Editor THE AUTOMOBILE:

[1,236.]—I should be glad if you could inform me, through your columns, what is the average consumption of gasoline per mile in White steamers. Does it vary in the amount consumed according to the rate of speed? What is the loss in power of the gasoline car between the cylinder and rear wheels? What is the loss in the steam car from cylinder to rear wheels, and how do you account for said loss? F. BARROW.

Chicago, Ill.

This is as low as six miles to the gallon and as high as thirteen; probably the average is about nine to eleven miles to the gallon of fuel. It naturally varies in accordance with the speed, as considerably more fuel will be consumed running at a low speed than at a much higher rate of travel. Every car has what may be termed its critical speed—i. e. the rate at which it is most efficient. In gasoline cars this has been found to be between twenty and thirty miles an hour, some being the most economical at twenty-five miles an hour, the increased amount of fuel at fifteen miles being almost 50 per cent., while the same thing is true when speeds of forty to fifty miles an hour are reached. At the lower speeds the excess is fuel wasted, while at the higher speeds it represents the extra amount required to propel the car at that rate.

Transmission losses vary in different cars, running as low as 15 per cent. and as high as 40 per cent., or even greater, and depending upon the age as well as the particular make of car, as gearing becomes much less efficient when worn. This, of course, has reference to the losses when on the direct drive, the clutch, universals and bevel drive being the chief points of loss. In the steamer there is the bevel drive and universals, so that the latter should naturally show a slightly superior transmission efficiency. In both cases the slippage at the road wheels and similar factors have been omitted from consideration as being the same in either case.

INFORMATION WANTED ABOUT "ENERGINE."

Editor THE AUTOMOBILE:

[1,237.]—Will you please inform me if "Energine," made by the Energine Refining Company, is superior to gasoline and not harmful to an engine?

Where can I get a complete descriptive directory of all makes of automobiles in the United States? C. F. WHEELER.

Vilas, Colo.

We have never heard exactly what substances were employed in the compounding of "Energine," nor, on the other hand, have we had any occasion to doubt the maker's claims to superiority. This also applies to your query as to whether it is harmful to the engine or not, no instance of complaint on this score ever having been brought to our attention. We do not believe that there is any such directory published. However, we have compiled complete lists in THE AUTOMOBILE once a year, the last one appearing in the issue just prior to the A. M. C. M. A. Show, held in the Grand Central Palace, New York, in October, 1907.

A CASE OF CHAINS RATHER THAN SPROCKETS.

Editor THE AUTOMOBILE:

[1,238.]—I am having trouble with the front sprocket on my Rambler Model 21 automobile, and would like a little information about it. The sprockets furnished by the factory wear out every 1,500 miles. The factory insist that they are all right, both in material and design. They are made of soft steel, case hardened. I would like to know if a sprocket made from tool steel would be more durable, and if not, what other material would give better service? Is the mileage I get all that can be expected? Would it be advisable to put on a chain boot, and, if so, why do not manufacturers put them on in the first place? It is not only a lot of work, but quite an expense to make replacements so often, and it is not at all satisfactory to me. PAUL F. FRANK.

Crestline, O.

Tool steel would not give anything like the service that can reasonably be expected from a case-hardened sprocket. It strikes us that the fault does not lie in the sprockets at all, but in the chains. The latter have become worn and are no longer of the proper pitch to suit the sprockets, which in consequence suffer from the chain's riding on the teeth to a greater or less extent, until the latter have worn away to a point where the distance between them is equivalent to that of the worn chain links, and then the sprockets are no longer fit for service. We think if you will replace the sprockets and the chain at the same time and will keep the chain properly adjusted you will have no further trouble on this score and that your mileage with a pair of sprockets will be greatly increased. A boot would save the chain if it could be kept oil-tight.

SOME QUERIES CONCERNING TIRES.

Editor THE AUTOMOBILE:

[1,239.]—Kindly help us out with the following problem. While we have never read anything of the same order in "Letters Interesting and Instructive," we feel it would be interesting to all subscribers. Last summer we used a pair of the well-known leather treads on our rear tires and found it took about 1-8 of the power, beside the trouble of keeping them absolutely tight. We wish to know if you would advise us to put them on a new car which we have just purchased, before the treads get worn. As the car is quite heavy on the rear tires anyway, we are at loss to know where we are at. What would you do in this case? Also advise us if we can use Goodrich tires on Goodyear Universal detachable rims. We are ordering an extra tire, and prefer the Goodrich, if we can use them. G. W. CURTISS.

Ravenna, O.

It depends upon what kind of roads you have to run over constantly whether it is worth while to consume as much as one-eighth of the power by using the leather, steel-studded treads. But a smooth tread pneumatic tire should always be kept inflated to a point where it is perfectly tight, so that one gives no more trouble on this score than the other. Goodrich or any other standard American tires can be used on the Goodyear rims, as the name "Universal" indicates. If the going is poor and apt to be slippery, doubtless the leather treads will be found well worth the extra amount of power they consume.

A FEATURE OF THE RENAULT AEROPLANE MOTOR.

Editor THE AUTOMOBILE:

[1,240.]—In your last issue, March 5, I read an article on the Renault engine, to be used by Farman. In describing the pistons, it stated that they are fitted with a circular groove in their base, pierced with holes to prevent oil passing from crankcase into the combustion chamber. Would you kindly describe this method of fitting a groove in the pistons, as I am inclined to believe it would be a good thing on a large number of engines, if it would prevent oil passing from the crankcase to the combustion chamber.

Scranton, Pa. E. J. HOWELLS.

This groove is turned in the piston near its lower end, and, with the exception of the holes, which are drilled clear through the wall of the piston, opening into the bottom of

the groove, it is the usual device employed for facilitating the oiling of the cylinder. This groove serves to catch the splash of oil in the crankcase and carries it up along the cylinder walls, and where an excessive amount is thus carried up it finds its way into the combustion chamber. In the Renault motor in question any excess is squeezed out through the holes.

SOME QUERIES CONCERNING GASOLINE.

Editor THE AUTOMOBILE:

[1,241.]—In looking over your columns, I noticed quite a number of questions from the subscribers, and thought possibly you might help me out. I have had some trouble with gasoline. Although the gasoline I get registers seventy-six, it does not seem to bring results. What I want to know is whether gasoline can be adulterated, profitably, in such a manner as to have it appear, when tested with a gauge, to be seventy-six. The gasoline I am getting has a clouded appearance instead of being clear. I strain all my gasoline through chamois, so it cannot be water that causes my trouble. I have had a good deal of experience with low-grade gasoline, and my car acts just like it was running on poor fuel. The car is practically new, and the carbureter is in perfect condition.

St. Louis, Mo. B. G. V. C.

We never heard of a case where the gasoline had a cloudy appearance and are at a loss to say what such a condition can be attributed to. It may not be gasoline at all that you are getting, and we may add for your information that there is little, if any, gasoline of the lighter grades of gasoline now on the market, such as 76 degrees s.g. In fact, the Standard Oil Company announced some two years ago that it was compelled to abandon marketing the lighter grades owing to the very heavy demand. Procure some good fuel and see how the motor acts with it. Probably some of our subscribers have had similar experience and can help us out.

QUERIES CONCERNING SINGLE-CYLINDER MOTOR.

Editor THE AUTOMOBILE:

[1,242.]—Being a subscriber to "The Automobile," I take the liberty of asking a few questions.

1. On a three-horsepower single-cylinder, four-cycle engine, would a mixing valve give a good mixture and good power at all speeds, and would the engine (with a 24-pound flywheel) be fairly flexible? Would I have to use a carbureter?

2. On the same engine—which is a jump spark—would an anti-vibrating coil be satisfactory, or would a vibrating coil be needed?

3. I have a small 6-volt dynamo with which I wish to spark this engine (after it gets going at a fair speed on batteries). Would I not need an automatic friction governor pulley on the dynamo to prevent it from burning itself or the coil out at high speed?

New York. H. L. G.

1.—A mixing valve would give good service, but a carbureter would be better. The flywheel is very light, unless it happens to be of large diameter. Unless it measures more than twenty inches in diameter it would require about twice this weight to permit of the motor being throttled down to any extent.

2.—A non-vibrating coil gives excellent service provided the timing device is dependable.

3.—A governor is an absolute necessity on any dynamo where the speed is apt to fluctuate between such wide limits as is the case on a small high-speed engine. It will undoubtedly ruin both itself and the coil otherwise.

LIGHTING SIDE AND TAIL LAMPS ELECTRICALLY.

Editor THE AUTOMOBILE:

[1,243.]—Will you kindly advise me, through your "Letters Interesting and Instructive," how one having an Apple dynamo and storage battery can light the tail and side lamps with the current? I find "The Automobile" very instructive as well as interesting.

Greene, Iowa. J. COMPTON.

The lamps can be wired directly from the battery on a circuit independent from the ignition circuit, and, provided the battery has sufficient capacity to carry both without impairing the ignition, the service will be perfectly satisfactory. In fact, the makers of the apparatus in question advertise that this is one of its advantages and will supply full information regarding the manner in which the wiring is done.

FOR BRAZING A CRACKED CYLINDER JACKET.

Editor THE AUTOMOBILE:

[1,244.]—I own a Reo runabout, Model B. Last fall, just before putting it away for the winter, I let the water freeze in it, which resulted in the bursting of the water jacket. I have had the opinion of several and find the best job can be done by brazing it. Could you refer me to some good, reliable firm that could do this? The jacket is cast iron and is a very nice thing to braze.

Lebanon, N. J. E. B. SHURTS.

Look through out advertising columns and you will probably find the announcement of some firm that makes a specialty of doing such work. However, if the crack is not very large it may be possible to repair it without brazing or even removing the engine from the chassis. Clean out the entire fissure as much as possible, and with the end of a chisel or a file try to make the interior slightly larger than the surface opening. Make a paste of fine iron filings, salammoniac and water in the proportion of about 90 per cent. filings and 10 per cent. salammoniac. Fill the crack with this completely and pack it very tightly, putting considerably more on the outside than is really needed. Allow it to rust for a few days and it will doubtless be found to hold water. Ordinarily there is very little pressure on water-jacket walls, so that this repair should give no trouble.

WANTED: SPECIAL VALVE-GRINDING COMPOUND.

Editor THE AUTOMOBILE:

[1,245.]—Will you please let me know whether there is on the market a substance for grinding valves other than emery or ground glass, and which, if accidentally introduced into the cylinder, will not score it?

In overhauling my engine, I find that the valves are in good shape and not at all pitted, but I should like to grind them in to insure tightness, and would like to use some such substance as indicated above. A. G. HOUGH.

Batavia, N. Y.

There are numerous special compounds on the market for valve-grinding and you will find some of them advertised in our columns. Whether any of them have the quality of not scoring the cylinder walls when they come in contact with them, but of proving good abrasives when applied to the valves, is a hard question to answer, as mere location does not change the nature of a substance. However, some of them are put up in such form as to facilitate preventing any of the compond getting into the combustion chamber.

TWO ASKING THE SAME INFORMATION.

Editor THE AUTOMOBILE:

[1,246.]—What kind of black top or leather dressing will be necessary, or what method will I have to pursue to make a red Pantasote top black? READER.

Necedah, Wis.

Editor THE AUTOMOBILE:

[1,247.]—Kindly let us know through "Letters Interesting and Instructive" what is a good cleaner for Pantasote tops.

Charlotte, N. C. OSMOND L. BARRINGER COMPANY.
A. W. McRae.

We will have to refer you to the manufacturers of Pantasote, as we do not know, nor have we ever heard that a material especially intended for this purpose was on the market.

WATER DRIPPING FROM THE MUFFLER.

Editor THE AUTOMOBILE:

[1,248.]—I am using a two-cylinder car and notice when the motor is started that a few drops of water comes from the muffler. Can you tell me the cause? J. C. SNYDER.

Metamora, Ill.

There is always more or less moisture in the air employed to make the explosive mixture. It vaporizes in the form of steam while the motor is running and escapes from the muffler, but when the engine comes to a stop there is some of it left in the cylinder, the exhaust passages and the muffler, and when these are allowed to get cold it condenses in the form of water. This is what you see issuing from the muffler when the engine is restarted.

BEST ROUTE FOR TRANSCONTINENTAL TOURING.

Editor THE AUTOMOBILE:

[1,249.]—Where can I secure a map of the best routes for transcontinental trips? A. R. M'LANE.

Prosser, Wash.

We would refer you to the May 16, 1907, issue of THE AUTOMOBILE, page 827, on which you will find an article entitled, "A Cruise Across the Continent," which is probably the most complete recent information to be had on the subject. We have also sent you particulars and map by mail. The only complete work extant on the roads of this country is the Official Automobile Blue Book of the American Automobile Association, but this as yet does not include any information on Transcontinental routes.

WHO CAN IDENTIFY THIS MOTOR?

Editor THE AUTOMOBILE:

[1,250.]—Kindly tell me through "Letters Interesting and Instructive" the name and manufacturer of an 18-20-horsepower two-cycle opposed water-cooled engine with valves in the head, mechanically operated, large square crank case, length over all about 49 inches by 14 inches, and large flywheel, 3 inches by 19 inches.

Sedalia, Mo. F. W. FISHER.

From the specifications you give we find it next to impossible to identify the motor you have in mind, as it is not customary to use a foot rule in examining a motor except where wanted to fill a certain space. Probably some of our subscribers will come to the rescue.

GEAR RATIOS OF A 45-HORSEPOWER CAR.

Editor THE AUTOMOBILE:

[1,251.]—What are generally considered as standard ratios of gear reduction for a 45-horsepower, water-cooled, shaft-driven touring car with sliding gear giving three forward speeds and one reverse? L. U. L.

Little Falls, N. Y.

Taking the Pierce Great Arrow, 1907 model, as a representative example of the American 45-horsepower car, the ratios are as follows: On the direct drive, 2.88 to 1; on the intermediate, 3.06 to 1; on the low, 3.26 to 1, while the reverse is slightly lower than the low forward speed.

DENATURED ALCOHOL ON A SMALL SCALE.

Editor THE AUTOMOBILE:

[1,252.]—I would like to have you send me a copy of the new denatured alcohol law, with information from which I can make a twenty-gallon still for its manufacture. G. H. FEATS.

Flint, Mich.

You can probably obtain this information by writing to the Department of the Interior, Washington, D. C.

KEEPING THE CYLINDERS AND PLUGS CLEAN.

Editor THE AUTOMOBILE:

[1,253.]—When I wrote you my experience with radium decarbonizer in my Ford Model N, I had no idea that there was such a need for just such an article. I know better now, and that is why I am writing this, for my brothers in trouble. I also know about the enormous circulation of your paper, "The Automobile," as nearly every mail since the publication of my article brings me pleadings for help on the lubrication question, asking what the decarbonizer is, and where it can be obtained. I am also made aware of the fact that there are readers of your most excellent journal who slight the advertising pages or they would find prominently displayed the advertisement of the radium decarbonizer people, even in the same issue as the one in which my few lines appeared.

In your last issue a correspondent asks a pertinent question as to kerosene oil and its effect on cutting other oils. I am glad he asked, as he did, for I did not make myself clear in letter No. 1,181. What I meant to say was "kerosene could be used at same time and would not soot up plugs or piston rings."

Now, for the benefit of all, I will give my experience for the past four months without looking at a plug. It is this: Twice a week I pour from a pint to a quart of cylinder oil, using Standard gas engine oil, which costs me 35 cents per gallon, into the breathing tube, or the upright pipe leading to the crankcase. After doing this I pour from 4 to 6 ounces of the decarbonizer into the same tube, screw down the cap and start the engine. A heavy, dark smoke will issue from the muffler, but will become lighter as engine gets hot; the plugs remain bright and clean. I also keep reservoir full of oil, with same proportion of decarbonizer, feeding about 20 drops to the crankcase and about 5 drops to the half bearing on main shaft per minute. I presume a higher grade of cylinder oil would require less of the decarbonizer.

The decarbonizer is put on the market to clean the cylinders, plugs, rings, mufflers, pipes, etc., when sooted and fouled up. When used in the manner indicated, it prevents the formation of carbon, and, so far as I know, I am the first person to use it as herein outlined. I have a very lasting and abiding impression of the trouble I used to have cleaning plugs and trying to regulate the oil supply, and now I have no trouble, so it seems to me the relation of my experience will not come amiss.

Milwaukee, Wis. J. L. WILLIAMSON, M.D.

CUTS OUT IGNITION TO SAVE MUFFLER.

Editor THE AUTOMOBILE:

[1,254.]—I have been very much interested in the discussion of the proper method of using the motor as a brake, and especially so in that of No. 1,204, which takes up the question of whether or not it is best to cut out the ignition while coasting down a grade. The theory is advanced that cutting out the ignition saves the battery and thus saves expense. While this is undoubtedly true as far as it goes, it seems to me that there is another phase of the question which demands serious consideration, and that is the question of the collection of unburned gas in the muffler.

In driving several different makes of cars it has been my experience that, after coasting down even a moderately long grade, with the switch off, there is apt to be in the muffler a collection of unburned gas, which will be fired by the first explosion in the cylinder after the switch is turned on at the bottom of the hill. This has occurred in cases where closing the throttle while the car was standing would stop the motor, as mentioned in the article referred to, which fact shows that the quantity of gas drawn into the cylinder during any one charging stroke was very small. These gas collections and the subsequent explosions are very apt to result in a destroyed muffler, and in four distinct cases have, to my knowledge, resulted in this way.

Now, if the spark is left on while coasting down a hill, this gas will be burned as it comes into the cylinder, and, on account of its small amount, it will burn with almost no explosion and therefore will not materially detract from the braking power of the motor.

It has been my experience, and not with one make of cars only, that even though the throttle on some makes of cars is supposed to cut off absolutely the supply of gas, in most cases a small amount will leak past on each suction stroke, and these successive small amounts, when allowed to collect for the short time taken to run down a comparatively short grade, will form a collection large enough to produce the results described above.

It seems to me, then, that unless a man is some distance from home with batteries which he knows to be weak, the insurance against muffler explosions and consequent damaged mufflers more than overbalances the small saving in battery consumption.

I hope to see more discussion of practical problems of actual road running. J. ARTHUR FISH.

Ithaca, N. Y.

SOME HINTS ON GRAPHITE LUBRICATION.

Editor THE AUTOMOBILE:

[1,255.]—In issue of March 5, you ask for "views of others on lubrication." It seems to me as though there should be no special fear of cutting or "seizing" of cylinders if a man will only get the "graphite habit." In my first machine, the Autocar, I began the habit of introducing graphite into the crankcase. In my next car, the Elmore, I kept up the habit, and followed the same habit with the Long Distance, the Reading Duryea and the Franklin—my last and best of all. In between I had two Stanley steamers, and graphite in the cylinders was a real necessity.

I introduced the graphite into the steam cylinders by means of a small hand-oil-pump attached to the steam pipe. This practice is all right with any steam automobile. As to how graphite may be introduced into the crankcase of a gasoline machine, no man with gumption need be told. In using graphite don't use over a teaspoonful to the pint of oil; you need no more. The graphite will not get up in the combustion chamber to do any harm. There need be no fear of its getting on to the spark plug. I have always used Dixon's 635, or motor graphite. This is a flake graphite, and the flakes build up all the microscopical irregularities on the bearing and wearing surfaces of pistons, rings, and cylinders, forming a graphite to graphite contact.

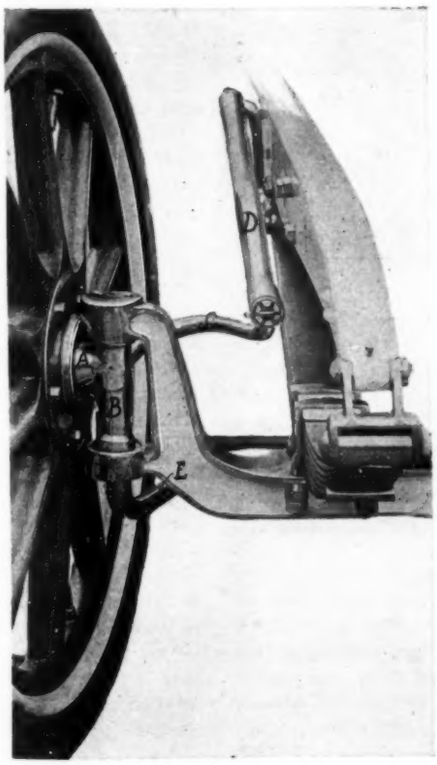
I have made use of the best amorphous graphite, but found that it formed into balls or pellets, and it doesn't withstand the great heat in the cylinder as well as flake graphite. When flake graphite is used in cylinders there will be better lubrication in cylinders, better compression, less oil needed, and greater satisfaction to the driver. There are many other places on the automobile where flake graphite will be found an important factor.

Jersey City, N. J. NO. 126, NEW JERSEY.

FEATURES OF THE STEARNS CAR FOR 1908

CONSISTENT adherence to a design that is the evolution of several years' experience and that has had ample opportunity to demonstrate its merit, marks the Stearns cars for 1908, and this applies not alone to its power plant, but to the entire chassis, including every one of those distinctive features of design and construction that have become familiar as earmarks of the Stearns product. For this season the four-cylinder car is a 30-60-horsepower car with cylinders having 5⅜-inch bore and 5⅞-inch stroke. Coupling it with the rear wheels are an expanding clutch, four-speed selective gearset and a side chain type of drive. The car has anti-friction bearings throughout, having no less than forty-four DWF bearings, distributed as follows: Wheels, eight; transmission, thirteen; motor, ten; fan, two; clutch, three; steering parts, four, and magneto, four. In the motor, three ball races carry the crankshaft and four carry the camshaft. The improvements as compared with the 1907 machine include carbureter refinements, new motor accessory arrangements, transmission improvement and some steering gear changes.

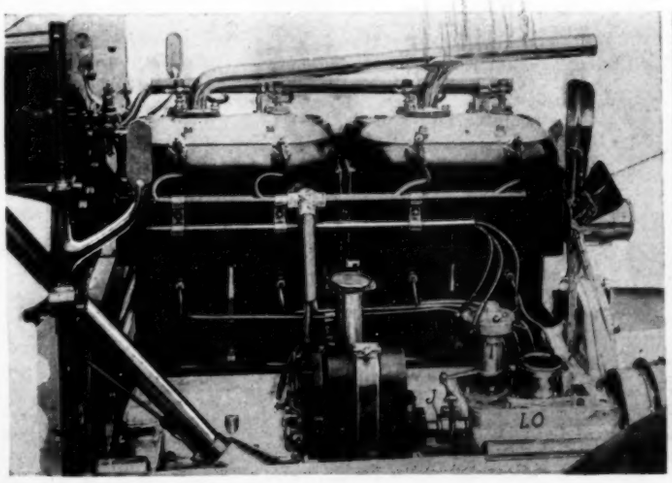
The Stearns four-cylinder motor resembles in general layout the 1907 one, in that its cylinders are cast in pairs with valves in an integral chamber on the left side and opened by direct lift from a camshaft within the crankcase. The cylinder castings are made without heads for the water jackets and take large oval plates instead. While this part of the design is as a year ago, great changes have been made in the arrangement of the water pump, oiler, timer and magneto. The water pump is carried within the left front motor arm, its position being a very unusual one, as indicated at *WP* in the right side engine illustration, as well as in the front view of the motor. Standing beside the engine, it cannot be seen, its location being indicated, however, by the pipe *W1*, which leads from the top of the motor support arm to the water jackets on the valve side. The crankcase is cast with a bedplate across its forward end, which forms a support for the radiator, thereby taking the radiator entirely away from the chassis frame and making it a unit with the motor crankscase, thus relieving it of all torsional strains.



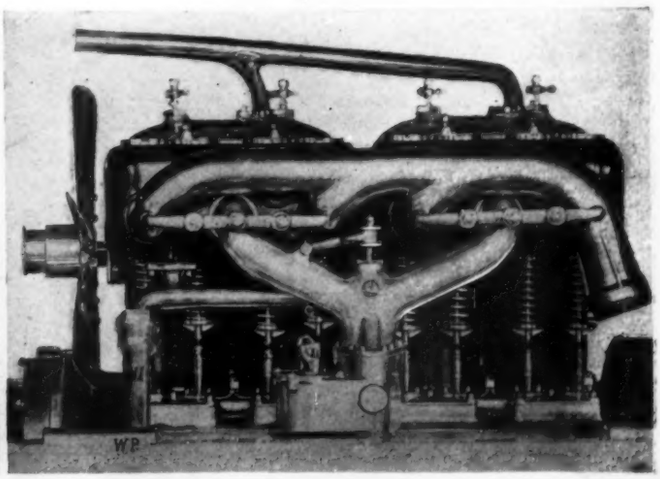
Stearns Improved Draglink Connection.

This construction brings the radiator and pump so close together that a hose connection between them is unnecessary, the only tubing essential being an elbow from the base of the radiator to an opening *W2*, whence the crankcase is drilled to the housing of the water pump. To remove the water pump, which is on a separate shaft, it is but necessary to remove a large diameter cap threaded into the rear face of the motor arm containing the pump. At the right side of the motor appears another example of what use can be made of the supporting arm. A multi-feed Lavigne oiler *L* has its casing the aluminum supporting arm, just as the water pump has its casing the supporting arm on the opposite side. A separate shaft gear-driven through an idler from the crankshaft, drives the bank of pumps in the oiler and has on its rear end a jaw coupling *J* for connection with the magneto. On the shaft is a helical gear for driving the short vertical shaft of the timer *T*. This arrangement gives a most compact grouping of the oiler, timer and magneto, and leaves ample room for the steering gear, the lower portion of the column of which appears in the rear of the magneto. The magneto rests on a bed plate which fills the rectangle between the crankcase, the frame and the front and rear motor-supporting arm.

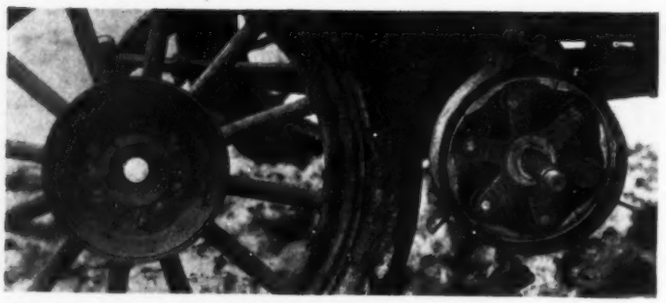
The Stearns crankcase is a one-piece casting instead of the conventional upper- and lower-half case, and because of this the crankshaft, camshaft and other motor shafts must be removed endwise through the front of the crankcase, and when removed the bearings and their bushings are removed with them. This is accomplished in the following manner: The rear bearing of the camshaft is held direct in the end of the crankcase; the second bearing has a bushing; the third bearing has a bushing of greater diameter than the bushing on the second bearing; and the fourth bearing has a bushing larger than either of the other bushings. In removing the camshaft these bushings



Exhaust Side, Showing Oiler and Magneto Drive.



Operating Side of Motor, Showing Double Carbureter.



Bronze to Steel Emergency Brake and Its Housing.

are removed with the bearing and the shaft, so that the opening in the front end of the case is of sufficient size to let the remaining bearings, with their bushings, pass through with ease. The same practice is followed with the bearings for the crankshaft. The compression release scheme, to assist in starting, consists of a set of four relief cams on the camshaft, operated by the movement of a rod by a pull at the base of the radiator.

Details of the Stearns Fuel System.

The most striking evidence of the painstaking attention that has been paid to every detail of the Stearns car is to be found in the carbureter, which is an evolution that is the product of two or three years' study. Its basic principle of design is that of providing a varying amount of fuel as well as air, in accordance with the power required of the engine, this being a development made necessary by the demand for large and powerful motors. It was found imperative to depart from currently accepted designs in order to accomplish this result, and as a matter of fact nothing on the car has received more attention than the carbureter, to which the designer attributes no little part of the smooth running of the motor. It is of the twin-nozzle type, the smaller nozzle, which has a fixed opening, located in a mixing chamber of its own, generating up to 30 horsepower, the larger nozzle having two orifices and being brought into use when power and speed above that furnished by the smaller one only are required. This carbureter offers four methods of control over the mixture, all of which are mechanically effected from a lever on the steering wheel. The controls are, briefly, as follows:

First, to keep the motor just turning over when the car is standing. Air enters through a fixed air opening. This air rising past the nozzle, passes up through a tube and then through a small opening regulated by a cone tipped adjusting screw; thence it finds its way to the motor. The exact amount of mixture permitted can be regulated by the adjusting screw.

Second—When starting the car, after it has been standing by the curb with the engine running, a plunger is depressed by means of the control from the steering wheel. Depressing the plunger opens a valve which allows the mixture passing the main nozzle to follow the main outlet instead of going through the bypass channel, as in the first case. This allows the full capacity of the small mixing chamber to pass to the motor, and to supply air for this the automatic valve is brought into action. With this arrangement it is possible to secure 30-horsepower from the motor.

Third—Should still more power be demanded, the plunger is further depressed. This opens a valve and immediately the big nozzle is brought into action in that the motor suction brings air past the large automatic valve.

Fourth—Should still more mixture be desired, the plunger is depressed still further, until it forces the expanded end of it upon the top of a tubular stem of a special valve in the upper part of the larger mixing chamber, and opens this valve, thereby giving the maximum amount of mixture to the cylinder.

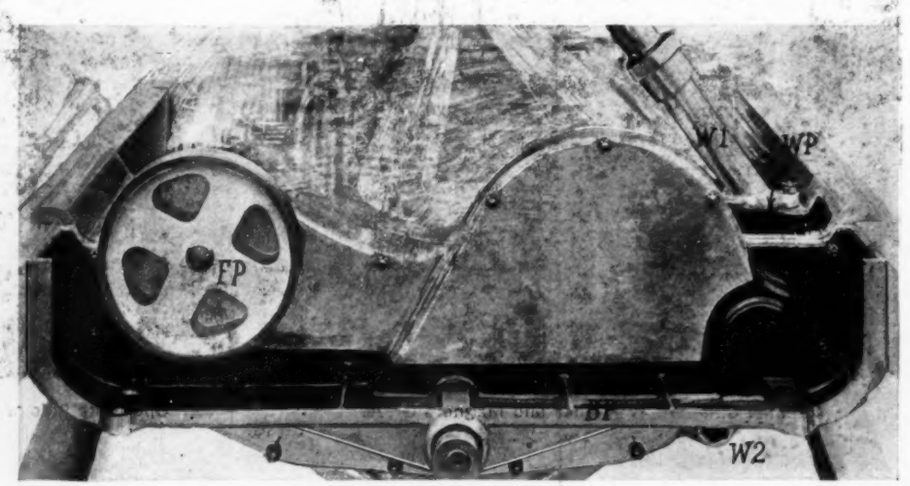
The expanding clutch which has been used on Stearns cars for several seasons has been retained intact. There are two expanding shoes in this clutch, each being semicircular and secured at one end to a fixed piece and at the other end to a swinging support. The expanding shoes are leather faced.

Ball Bearings Throughout Transmission.

In the Stearns gearset the use of a four-speed selective set with direct drive on the fourth speed is continued. This gearset remains practically as it was in 1907, except for change in the design of the case to give compactness and add strength. In all, thirteen DWF bearings are used. A universal coupling is interposed between the clutch and gearset. Side-chain drive is continued, and the adjustment of the chains consisting of a radius rod, swiveled at its rear end of the axle, and hinging at its front to a member with a spur to which the rod attaches. Threaded into this sleeve is a rod which is adjusted by a nut and locknut. One of the illustrations shows the expanding shoes of the emergency brakes, which are bronze segments that act against the interior force of the steel drum on the wheel.

The improvements in the running gear largely center around the steering knuckle, although the frame has been dropped 2 1-2 inches in front of the rear axle to give a lower body carriage; except for this the side members are straight from end to end. In the steering knuckle the great change is the forging in one piece of the spindle *A* for carrying the wheel, the hub portion *B* forming the pivot, the arm *E* with ball end for connection with the tie rod to the opposite knuckle and the knuckle arm *C*, which connects to the draglink *D* that couples with the steering gear. New also is the use of the DWF bearing in the top of the knuckle, which carries the weight of the car. After making these four parts, *A, B, E, C*, integral, it was necessary to make the opening in the lower end of the axle jaw of sufficiently large diameter so that the hub *B* could be pushed through the opening until the top of the hub was free to enter the opening in the top of the jaw. Bushings are used for filling the extra space in the lower arm of the jaw. The steering gear has been improved by increasing the strength and size of all its parts. It is a worm and pinion gear, and is supported on the bedplate which carries the magneto. A pronounced improvement consists of carrying the draglink *B* high and outside of the frame, so that it parallels the side member, thereby occupying a position of safety.

A critical examination of the design and constructional details of this year's representative of the Stearns is strongly indicative of an advanced trend, particularly where the motor is concerned, simplicity and compactness forming the keynote throughout, as is evident from the manner of placing the accessories, the radiator mounting being a particularly noteworthy feature.



Novel Arrangement of Water Pump and Lavigne Oiler.

A TWO-DAY TRIP IN SOUTHERN CALIFORNIA

PASADENA, CAL., March 11.—There were just thirteen in the party, and two Packard "30's" were utilized for the 207-mile jaunt. The presumably unlucky total number of tourists, however, had no effect upon the spirits of those participating, and the weather was such as only California can produce in February. It was a quiet, domestic tour, the families of J. M. Murdock, of this city, and L. S. Hackney, of St. Paul, Minn., making up the party.

Start was made for the two-day trip on a Friday morning and a southeasterly course was taken, with Riverside as the goal of the first day's run. A St. Valentine's day lunch (for it was February 14) was eaten in the open, when the noonday halt along the road was made, and the picknickers are the subject of the first snapshot which illustrates the story. The next picture below and the one in the lower right-hand corner of the page show both the Packards in action as they forded a small stream near Arcadia, some miles out on the first day's journey.

The road to Riverside skirts the foot-hills of the San Bernadino range, some 30 miles to the east. Riverside is the head and center of one of the richest orange-growing sections in the world, and the county seat of Riverside county. It is 65 miles east by south from Los Angeles, and is noted for its beautiful streets and surroundings. Here the party stayed over night at the Glenwood Hotel, and next morning started from the Mission Garage, for Redlands, Highlands, San Bernadino, and home. The winding road up Huntington drive on Mt. Rubidoux was taken out of Riverside, and two of the illustrations show the cars on the route. A photo of the party was taken at the summit of the mountain. As the road approaches the city of San Bernadino the mountains increase in grandeur, and the scenery is magnificent. The city which stands near the site of an abandoned Spanish mission of the same name has a bit of interesting history as a municipality. It was founded by a company of Mormons in 1851, who wished to establish a way station for the emigrants to Utah by way of the Pacific route. It was incorporated in 1854, but on the withdrawal of the Mormons, in 1857-58, its importance declined so rapidly that it was dissolved in 1861. In 1863 its charter was restored. The population has increased rapidly, until now it numbers about 7,000 souls. The town is also noted for its mud baths.

The route of the trip carried the party into three counties. Counties in Southern California mean more in dimensions than they do in the Eastern States. San Bernadino is the county seat of the county of that name, the largest in the State, covering an area of 19,947 square miles, and extending from the city of San Bernadino, which is situated in the southeast corner, to the Colorado river, almost 200 miles away to the east, and north about 110 miles, to the Inyo county line. Practically all that is inhabitable of San Bernadino county is the southwest corner, west of the mountain range. The rest is desert land, hot and dry, the Mojave desert and sink of Mojave occupying a great part of the vast area.

Riverside county is also a garden spot in the western part and a desert in the east. It is about 40 miles broad from north to south, and borders San Bernadino county on the south its entire length. The county of Los Angeles, however, secured the bulk of the trip. It is the real "American Italy," the paradise of the tourist, and the ideal home of the all-the-year-round automobilist. If there is any touring ground the world over that can surpass Southern California in anything but the matter of roads we have yet to find it, and the countless hundreds who make an annual pilgrimage across the ocean to enjoy the delights of French and German scenery and historic resorts, will find a vast amount to interest them here at home, if they only knew it. Of course, there are not the miles and miles of straight and level highways that distinguish Continental Europe, where lenient regulations make "letting her out" a delight that can be indulged in on every occasion that the reasonable handler of the wheel could possibly desire to do so. This is a drawback, but this part of California can never have such roads, regardless of the amount she is willing to spend on improvements and construction, as the country is much too mountainous.

Typical and Picturesque Scenes Along the Route of a Two-days' Tour in Southern California.

BOOKS FOR AUTOMOBILISTS.

Ignition Troubles; Effects, Causes, Etc.—This is the title of a booklet from the pen of Harry Eisner, E.E., of Boston, Mass., who has treated the subject in a concise and clear manner, so that the man who has had no experience whatever can understand the subject matter and follow it by means of the numerous standard wiring diagrams which form part of the work. Every form of ignition apparatus at present in current use is briefly touched upon. The pamphlet is being distributed by the Gordon Automobile Supply Company, Inc., 1024 Boylston street, Boston, Mass.

An Automobilist's Diary.—Of a convenient form, carefully compiled and well produced, the Automobilist's Diary and Reference Book for 1908, from Case & Hechinger, Boston, should be well received by the touring automobilist. A tabulated table is given for each day of the year, with blanks for filling in such matters as are likely to be useful or interesting for future reference. In a small form there is a mass of information valuable to all drivers of a car. The diary is well bound in leather.

A Romance of the Automobile.—In eight honks and one crash, Julian Street paints with considerable skill a picture of his first motor experience, in a publication from the John Lane Company, New York, entitled "My Enemy the Motor." It is a somewhat grim sort of a romance—if grimness and romance can be associated—but the telling of it is well done, the locale excellent and the illustrations an embellishment. Mr. Street is now driving his second Locomobile, and lives at Greenwich, Conn.

Curing Automobile Diseases.—In the hands of the automobile doctor the disease of the gasoline-propelled vehicle appear to multiply as rapidly as ills of the flesh. Certainly A. L. Dyke in his "Diseases of the Gasoline Automobile and How to Cure Them" has unearthed enough to satisfy the most rabid trouble hunter. The book is obtainable from the Phoenix Supply Company, St. Louis, Mo.

TESTING CARS UNDER WINTER CONDITIONS.

Heavy snowfalls add to the work of both the tester and the car which is being put through its initial work-out on the road, but that they do not deter either from undertaking their daily round of work is evident from the accompanying photograph showing a couple of Premier testers, a few miles from the Premier factory in Indianapolis. Contrary to the usual order of things during the past few months, the Premier Motor Manufacturing Company has been running its entire plant in full swing, and has even found it necessary to do a great deal of overtime work so that the reasons for putting cars to the test as fast as they were turned out will be apparent.

Testing a Premier on Indiana's Snow-covered Roads.

THE AUTOMOBILE CALENDAR.

AMERICAN.

Shows and Meetings.

Mar. 18-24.....—New Haven, Conn., Music Hall, Annual Show, New Haven Automobile Dealers' Association.
Mar. 21-28.....—Toronto, Canada, St. Lawrence Arena, Automobile Show. R. M. Jaffray, manager.
Mar. 23-28.....—Indianapolis, Ind., Annual Show, Automobile Dealers' Association.
Apr. 4-11.....—Pittsburgh, Pa., Duquesne Garden, Annual Show. Automobile Clubs of Pittsburgh. Thomas I. Cochran, manager.
Apr. 5-12.....—Montreal, Canada, Arena, Third Annual Automobile and Sportsman's Show. R. M. Jaffray, Mgr.
Apr. 6-8.....—Denver, Mammoth Rink, Annual Automobile Show. G. A. Wahlgreen, manager.

Race Meets, Hill Climbs, Etc.

Apr. 6-10.....—New York City, Automobile Carnival, Illuminated Parade, Hill Climb, etc., New York Automobile Trade Association.
Apr. 24.....—Briarcliff Trophy Race, Westchester County, N. Y. Robert L. Morrell, chairman.
May 4-5.....—Harrisburg-Philadelphia and Return, 300-mile Endurance Run, Motor Club of Harrisburg.
May 15.....—Chicago, Algonquin Hill Climb, Chicago Motor Club.
May 16.....—Hartford, Conn., 200-mile Endurance Run, Automobile Club of Hartford.
May 30.....—Bridgeport, Conn., Sport Hill Climb, Bridgeport Automobile Club.
June 24-27.....—Chicago, 1,200-mile Reliability Run, Chicago Motor Club.
July 6-8.....—Buffalo, National Convention of the A. A. A., and Start of Fifth Annual Tour.
Sept. 14.....—Chicago, Annual Economy Run, Chicago Motor Club.

FOREIGN.

Shows.

Mar. 21-28.....—London, Agricultural Hall, Cordingley's Show.
Mar. 28-April 6.—Paris, Alcazar d'Ete, Small Inventors' Exhibition.
Mar. 26-April 4.—London, Olympia Industrial Vehicle and Motor Boat Show.
May 17-31.....—Austria, Budapest Automobile Show.
May 17-June 2..—Moscow, Russia, International Automobile Exposition, Automobile Club of Moscow.
December.....—Paris, Eleventh Annual Salon de l'Automobile, Grand Palais, Automobile Club of France.

Race Meets, Hill Climbs, Etc.

April 1-13.....—Monaco Motor Boat Races and Motor Boat Exhibition, International Sporting Club of Monaco.
April 25-May 25—Industrial Vehicle Competition, Automobile Club of France.
May.....—Paris, Competition for Agricultural Automobiles, auspices of "L'Auto." (Date to be announced.)
May 7.....—Sicily, Palermo, Targa, Florio Circuit, Voiturette Race, Automobile Club of Italy.
May 11-16.....—Ireland, Irish Reliability Trials.
May 1-31.....—Automobile Taxicab Competition, France, Automobile Club of France.
May 10.....—Sicily, Targa Florio, Automobile Club of Italy.
May 31.....—Russia, St. Petersburg to Moscow Race.
June 1-18.....—Reliability Trials for Pleasure Cars, Automobile Club of Great Britain.
June 9-17.....—Touring Competition for the Prince Henry of Prussia Prize, Germany, Imperial Automobile Club of Germany.
July 6.....—Voiturette Grand Prix, Dieppe Circuit (Automobile Club of France).
July 7.....—Grand Prix of Automobile Club of France, Dieppe Circuit.
July 13-17.....—Ostend, Belgium, International Race Week, Automobile Club of Ostend.
July 20-30.....—Ardennes Circuit Races and Coupe de Liederkerke, Automobile Club of Belgium.
Aug.....—France, Coupe de la Presse, Automobile Club of France. (Exact date to be announced.)
Aug. 29-30.....—France, Mont Ventoux Hill Climb, Vauclusien Automobile Club.
Sept. 1-8.....—French Voiturette Contest, auspices of "L'Auto."
Oct. 11.....—Berlin, Germany, Gordon Bennett Balloon Race. Aeronautical Club of Berlin.

Ever-Increasing Use of the Automobile as Evidenced by the Daily Scene in Dry Goods Shopping District of New York City.

CONVICT LABOR FOR ROAD BUILDING IN THE CAROLINAS

By F. S. SLY, Traveling Correspondent of The Automobile.

CHARLOTTE, N. C., March 11.—There are about 125 cars in this city, and it has just received its first automobile truck, which is a Franklin, sold by O. L. Barringer recently to the General Fire Extinguisher Company.

There has been some talk of getting together and organizing a club, but as yet nothing has come of it, though the majority of the individual owners are enthusiastic autoists.

Here, as everywhere else in North Carolina, the county is using its convict labor to build macadam roads, and about 100 miles have already been constructed. The clay roads are very good in summer, but in wet weather they become almost impassable.

The dealers are O. L. Barringer, who handles the Franklin, Autocar, Cadillac, White, Pope-Waverly and Buick; the Charlotte Motor Car Company, who have the Ford, Rambler and Reo, and Hans and Ross, who represent the Maxwell. The first two firms are the only ones here maintaining garages.

SPARTANSBURG, S. C., March 12.—This city claims to have more paved streets than all the other cities in South Carolina combined, and it certainly has many miles of fine pavement. For several years past Spartansburg County has been building about five miles of macadam road annually with convict labor, and, in addition to continuing this program, is now planning a bond issue of $200,000 to further the work of road improvement. Here, as elsewhere in the State, the soil is clay and becomes very bad in wet weather.

In the city itself there are about sixty cars, and F. S. Bryant is probably the most progressive autoist here, no club having been formed as yet.

The only garage is maintained by the Spartansburg Automobile Company, representing the Ford line.

GREENVILLE, S. C., March 13.—Although this city has a smaller number of cars than either Charlotte or Spartansburg, only being able to boast of fifty-five all told, it already has an automobile club, known as the Greenville Automobile Association, of which Perry Beattie is president; A. P. Hoke, secretary, and R. N. Tannehill, treasurer. At present the membership is thirty, and as Mr. Tannehill says the prospects are bright for a large number of sales this year, the future of the club is correspondingly so.

Garages are maintained by the Barr Hardware Company, representing the Maxwell, and R. N. Tannehill, handling the Franklin and Buick, while Nugent F. Bates represents the Cadillac. The roads are good in summer, and as is the case with neighboring counties, convict labor is being employed for their improvement.

LOUISIANA LEAGUE TAKES UP ROAD CONSTRUCTION WORK

NEW ORLEANS, March 16.—Local auto enthusiasts now realize that it is the lack of good roads throughout the South that prevents them from getting the much-coveted Glidden tour. To this fact alone they attribute their failure to get the 1908 tour. But if good roads will bring it, the Automobile League of Louisiana is taking the proper course, for they have started a campaign for better roads.

A movement has now been started to have the road between this city and Baten Rouge improved and placed in shape for traffic of all sorts. This road, which follows the Mississippi River, is one of the most picturesque in the State and would make an ideal course for short tours. The road is 125 miles long and without any great expenditure of money could be placed in excellent shape. To have this accomplished is now the aim of the Automobile League.

Last week a trip was made to Baten Rouge by a party from this city, headed by Palmer Abbott. The trip was made in the famous "Mudlark No. 3," which recently completed a tour from New York City to the Crescent City. For the first thirty-five miles out of this city they encountered all sorts of difficulties, the road being in horrible shape. This was caused by the moving of the levee back, and the road is merely a trail through the plantations. The remainder of the road is in fairly good shape, being kept up by the plantation owners, all of whom are more than anxious that the whole road be improved.

Some time next week a party, composed of Palmer Abbott, G. E. Demack, Dr. Joseph M. Woodward and Dr. R. E. DeBuys, will start out in several machines and make this trip, visiting each parish. The authorities in each parish will be interviewed and asked to co-operate in the plan to improve the road, especially the first thirty-five miles out of this city, where it is in a horrible condition. The members of the various levee boards will also be seen and asked to do their share of the work.

"About all that is needed," said Mr. Abbott, "is to drain the roads on both sides with ditches and to run a traction engine over the roadway in order to smooth it. The matter will be pushed vigorously and local enthusiasts hope to have the road in excellent shape by the middle of the summer. This is not the only road that the Louisiana Automobile League have in mind, but they are going to make it a general State movement."

THE AUTOMOBILE

Vol. XVIII Thursday, March 19, 1908 No. 12

THE CLASS JOURNAL COMPANY
Flatiron Building, Madison Square
New York City

H. M. SWETLAND, President

EDITORIAL DEPARTMENT
A. G. BATCHELDER, Managing Editor
R. F. KELSEY, Associate Editor C. B. HAYWARD, Engineering Editor
W. F. BRADLEY

BUSINESS DEPARTMENT
A. B. SWETLAND, Business Manager
LOUIS R. SMITH FRANK B. BARNETT
W. I. RALPH, 1035 Old South Building, Boston, Mass.
C. H. GURNETT, H. E. WESTERDALE, 836 Monadnock Block, Chicago, Ill.

Cable Address - - - - - - - - - - - - - - Autoland, New York
Long Distance Telephone - - - - - - - - - - 300 Gramercy, New York

SUBSCRIPTION RATES:

United States and Mexico - - - - - - - - - - - - One Year, $3.00
Other Countries in Postal Union, including Canada - - - - One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

FOREIGN SUBSCRIPTION AGENTS:

ENGLAND:—Illiffe & Sons, Limited, 29 Tudor Street, London, E. C.
FRANCE:—Boyveau & Chevillet, 22 Rue de la Banque, Paris.
GERMANY:—A Seydel Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Copies printed in 1905 - - - - - - - - - - - - 730,000
" " in 1906 - - - - - - - - - - - - 791,000
" " in 1907 - - - - - - - - - - - - 888,900

NO SINGLE CLUB CAN CONTROL HERE.

Obsessed by a name which has become misleading, vainly trying to have the club what it is not and never can be, a few now in control of the Automobile Club of America, finally disgruntled because its spokesman could not dictate the policy in legislation and other matters of the New York State Automobile Association, has seen fit to decree its resignation from that organization, which high-handed action also carries with it the severance of all relations with the American Automobile Association.

Recognizing the patent fact that only through local, State and national action can there be secured those things which add to the progress and enjoyment of automobiling, the growth of the American Automobile Association under the existing administration has been substantially cumulative. In union there is strength, but if the clubs of a State worked as separate units, and, inevitably, often at cross purposes, there would be little accomplished and results would be few and far between.

In France the Automobile Club of France, with headquarters in Paris, does "lord" it over the clubs of the provinces, and in Great Britain the Royal Automobile Club, located in London, is attempting to do the same thing, after a break with the Motor Union of Great Britain and Ireland, with indications that its plans will go decidedly amiss; in fact, negotiations are in progress for a readjustment of differences. But foreign procedure is seldom successfully transplanted to these democratic United States, and this was quickly demonstrated at Chicago in March, 1902, when the clubs there assembled—Chicago Automobile Club, Automobile Club of New Jersey, Long Island Automobile Club, Rhode Island Automobile Club, Automobile Club of Philadelphia, Princeton University Automobile Club, Automobile Club of Utica, and the Grand Rapids Automobile Club—emphatically declined to accept the A. C. A. of New York City as the fountain head of government, although the Automobile Club of America was represented at the meetting. At that time A. R. Shattuck was the president of the A. C. A., and annually he visited Europe, and, perhaps, brought back ideas that he thought deserved transplanting.

But the American Automobile Association was born at Chicago with all clubs on an equality—each club casting its total membership vote and no more. In its early years the A. A. A. progressed spasmodically, always subjected to the scrutiny of those who would not have it interfere wth the ultimate hope of A. C. A. supremacy. Several administrations of A. A. A. affairs gave little except unfulfilled promises and some dissensions that threatened its very existence.

Then came the Hotchkiss era and a leader surcharged with determination and enthusiasm. He took up the work the others had thrown down. Previously he had raised the New York State Automobile Association to a high degree of perfection—accomplishing it without any considerable aid from the inner circle of the A. C. A., for, let it be kept in mind, the members under a constitution which has been gradually "perfected" are not required to bother much with the conduct of the club. The self-perpetuating governors do that with an expertness which has earned the admiration of politicians.

Still nursing that deferred desire to "nationalize," the strongly intrenched clique of the A. C. A. has watched with unfeigned jealousy the growth of the A. A. A. into a national organization of dignity and far-spreading influence. An effort was made to get control of the Vanderbilt Cup, but its frank and fair-minded donor let it be understood without hesitation where he stood on that proposition. To this event—established mainly through the energy of the indefatigable Pardington—the A. A. A. owes much, for the race's 1905 and 1906 surplus furnished the financial sinews for carrying on the work of education and organization—a better use for the money than investing it in a big clubhouse.

It is well remembered by New York State autoists how they were nearly forced several years ago to accept a most obnoxious law, how Mr. Shattuck was "thanked" for his services at Albany, and then another committee undid what had been almost done. Once more we find Mr. Shattuck "legislating" at Albany, and now, despite the action of the State association on which his club had a member, we find this industrious automobile patriot insisting that larger fees should be paid than those contained in the bill of the State association. Of course, President Quayle resented this meddling, whereupon there followed the resignation of the A. C. A., thus indicating that that club is Shattuckian governed and consequently useless except as a means of employing the time of that self-absorbed toiler who at least deserves the credit of being honest in his misdirected endeavors.

But the A. A. A. will go on with its work, for it is founded in the needs of the hour. The A. C. A. may be rescued from ring rule, for many members are at variance with the present suicidal policy. Time alone will tell the story.

A. A. A. EFFORT FOR FEDERAL REGISTRATION

WASHINGTON, D. C., March 16.—Legislative hearings often mean nothing; their purpose frequently is to deceive rather than to enlighten. The session on Thursday last before the Judiciary Committee of the House of Representatives, with the Federal Registration Bill of the A. A. A. as the topic of discussion, was a hearing seldom seen, according to the opinion of experienced observers, and the masterly presentation of argument in behalf of the measure was undeniably brilliant, logical and grudgingly convincing to lawyers sharpened by contact with all manner of constitutional problems. Charles Thaddeus Terry, chairman of the A. A. A. Legislative Board, counsel of the National Association of Automobile Manufacturers and professor of law at Columbia University, was the man who bore the burden, concisely putting forth the claims of the proposed law, accepting with evident enjoyment the repeated assaults that came to him across the committee table and never losing his equanimity even when the questions were plainly intended to destroy the continuity of his really wonderful marshalling of the facts in the case. Chairman Jenkins, of Wisconsin, is understood to be a stickler in conforming to the Constitution, and at times it seemed to the automobilists that he was searching more for material to sustain his own deductions rather than to learn on what grounds the automobilists sought the right to go anywhere in this country after informing the Federal government that they had complied with the laws of their own States, and thus obtain a national passport.

The hearing was opened by President Hotchkiss, who briefly pointed out the necessity for interference on the part of the Federal government to protect the motorists of the nation while operating in those States which require the registration of nonresidents and use the requirement as a means of taxation.

Chairman Terry Ably Presented His Argument.

The principal argument was made by Chairman Terry. It was practically conceded by the committee that legislation of the kind asked for was necessary, and that it should be accorded if Congress had power under the Federal Constitution to regulate the registration of motor vehicles when operated in States other than those of their owners' residences. It was apparent at the outset that the question being an entirely new one, and the powers of Congress being necessarily limited to its control over commerce between the States as granted to it by the Constitution, and as construed by the commerce decisions of the Supreme Court, the problem to be solved was whether Congress could in any way regulate the use of a pleasure vehicle, when operated on the highways of a State other than the State of the owner's residence; in other words, when engaged in interstate travel. It was apparent, also, that most of the members of the committee had grave doubts as to such travel being within the meaning of the word "commerce" in the Constitution. Hence, when it is stated that after a two hours' presentation by Mr. Terry, several members of the committee stated that while they had been very doubtful, they had been either wholly or almost convinced that Congress had the power to pass the Cock's bill, the high merit of Mr. Terry's presentation will be appreciated.

In substance his argument was that though the word "commerce" originally connected an interchange of commodities from State to State, the Supreme Court had from decade to decade widened the meaning of the word until it now included not merely trade but transportation, the interchange of telegraph messages, the carrying of lottery tickets on the person of a mere traveler, travel itself; in fact, intercourse between the States in the broadest possible sense of that word. It can be stated with some confidence that as to this the committee seemed to agree with Mr. Terry. In other words, he demonstrated to the committee that Congress had power to legislate concerning the registration of the newest means of intercourse, or intercommunication, between the States.

Mr. Terry also called attention to a line of decisions by the Supreme Court, which held that under the commerce clause of the Constitution the Federal government had power to pass laws which would prevent one State from exacting license fees, tolls, or taxes, either from vessels or from their pilots or masters, when plying navigable waters entirely within a State other than the State where the vessel was enrolled, and called attention to the fact that there was in principle no difference between the natural highways of a State or nation, that is, the waterways and the dirt highways, and also that there was no difference in principle between a vessel navigating such natural highways and a wheeled vehicle using such artificial highways. Asked by Congressman Malby of the committee whether there was not a distinction between vessels engaged in interstate trade and purely pleasure vessels, Mr. Terry called attention to the case of the yacht "Yosemite," in which the Supreme Court held that there was no such distinction and that a vessel operated between ports of different States and purely a pleasure yacht, was properly subject to the law preventing exactions by States other than that of its enrollment, and that this statute rested solely on the commerce clause of the Constitution.

While the chairman of the committee and several of its members repeatedly asked questions which indicated that they had grave doubts as to the constitutionality of the bill, Mr. Terry's argument made a deep impression and entirely convinced several of the committee. It is not likely that final action will be taken on the bill for some weeks, owing to other matters pressing on the attention of the Judiciary Committee, but it is confidently expected by Mr. Terry and his associates that such action will ultimately be favorable to the bill.

Interviews with members of Congress not on the Judiciary Committee led to the conclusion that should the bill be favorably considered by such committee the bill will pass without substantial amendment or opposition. It is hoped that members of the American Automobile Association will continue to express their interest in the bill to their representatives at Washington, particularly those on the Judiciary Committee.

President Hotchkiss Headed a Representative Delegation.

It was a substantial representation that President W. H. Hotchkiss assembled at the Capitol, and they came from a dozen State bodies of the National organization. This president has proven the salvation of the A. A. A., which in the past has been led by men who have not had the time or the enthusiasm to do the big work properly. And right here let it be said that Secretary Elliott has been a conscientious factor in carrying out the plans of the president. The delegation present included the following:

William H. Hotchkiss, president American Automobile Association; Charles Thaddeus Terry, chairman Legislative Board, New York; Frederick H. Elliott, secretary American Automobile Association; Russell A. Field, Long Island Automobile Club, Brooklyn; A. G. Batchelder, New York State Automobile Association; C. H. Benedict, Automobile Club of Schenectady; Robert P. Hooper, Automobile Club of Germantown and Philadelphia; Paul C. Wolff, Pennsylvania Motor Federation and Automobile Club of Pittsburg; Jacob D. Rider, Lancaster Automobile Club; G. Douglass Bartlett, Quaker City Motor Club, Philadelphia; W. C. Crosby, New Jersey Automobile and Motor Club and Associated Automobile Clubs of New Jersey; R. A. Green, New Jersey Automobile Trade Association, Newark; J. H. Edwards, Automobile Club of Hudson County, Jersey City; William H. Hunt, Automobile Club of Hudson County; Walter S. Schutz, Connecticut State Automobile Association, Hartford; F. T. Staples, vice-president Connecticut State Automobile Association, Bridgeport; Robert B. Caverly and LeRoy Marks, Automobile Club of Washington, D. C.; Charles J. Forbes, Jr., Cleveland Automobile Club; Dr. A. B. Beyle, Cincinnati Automobile Club; Hon. F. H. Gillette, Automobile Club of Springfield, Mass.; L. R. Speare, Bay State Automobile Association and Massachusetts Automobile

Club, Boston; Osborne I. Yellott, Automobile Club of Maryland; John Bancroft, Delaware Automobile Association, Wilmington; F. E. Chapman, West Virginia State Automobile Association; George Ade, Indiana State Automobile Association; S. Boyer Davis, Automobile Club of Philadelphia and chairman of the legislative committee of the Pennsylvania Motor Federation.

The Professional Chauffeurs' Club of America was also represented by President Sullivan and ex-President Walters, with Xenophon P. Huddy, its counsel. The latter discussed the bill briefly, urging chiefly that it be amended so as to permit the Federal registration of chauffeurs while operating motor vehicles in States other than those of their residence.

President Caverley, Secretary Marks and Director Stoddard comprised the Automobile Club of Washington trio responsible for the entertainment of the visitors, the festivities including a smoker at the club's country home.

Congressman Cocks, who accepted responsibility for the bill in the House of Representatives, isn't afraid these days to be seen in the company of automobilists. When one remembers the unpopularity which this thoroughly straightforward legislator once enjoyed when, in the early days of the industry he sought, as a member of the New York State Legislature, to obtain a statute which in the light of subsequent events seemed liberal at the time, his present championing of the rights of automobilists is not so remarkable after all. And there were other congressmen who were not afraid to dine with the autoists in the glaring electric light of the New Willard on Wednesday evening. These were Malby, Alexander and Moon. When the work of organization of automobilists has attained greater numerical strength there will be more legislators enough unafraid of their constituents to dine with autoists in public. In fact, it is not a wild prediction to make that if the Federal bill can emerge from the committee it will receive enough votes to become a law.

PROVISIONS OF THE PROPOSED NEW YORK AUTOMOBILE LAW

THE New York State Automobile Association, through President Quayle, announces that the new bill for the regulation and registration of automobiles in the State of New York conforms as nearly as is possible to the uniform automobile bill as suggested by the American Automobile Association, and which is now being considered by the Legislatures of Ohio and Massachusetts. This is the first step toward establishing uniform legislation. The marked differences between this bill and the present motor vehicle law are as follows:

First.—The bill provides for the annual registration of motor vehicles, and for the payment of fees sufficiently large in amount to be equivalent to taxation of those vehicles by the State. It is anticipated that the revenue derived from this taxation will return to the State, for the first year, from $250,000 to $300,000, with a substantial increase each year thereafter, as motor vehicles multiply. All of the revenue so obtained shall be paid to the special fund for the maintenance of State highways. The fees to be paid are to be based upon weight, and should vary from $2.00 for the lightest vehicle to not more than $15.00 for the 6,000-pound cars.

Second.—A positively thorough method of identification of motor vehicles when on the public highways is provided for in the provision that all vehicles shall hereafter carry numbers (front and rear), the said numbers to be changed in color each year, and to be issued and provided by the Secretary of State. Severe penalties are imposed for violations of this provision.

Third.—In addition to the usual provisions as to lamps, horns, etc., there is an entirely new provision prohibiting the use of non-skidding tire devices, except when the highway is covered with ice or snow, or in an otherwise dangerous condition.

Fourth.—The usual exemption for non-resident owners. The same prohibition against local ordinances affecting automobiles, as is in the present law, together with a brief definition of permissive speed, which corresponds to that recognized in foreign countries, and very much like the provision of the Connecticut law, which is in operation to-day.

Fifth.—To assist local magistrates in enforcing the law as to the second and third offences, provision is made for the transmission of records of convictions, under the law, to the Secretary of State, who, in turn, is obliged to notify all the county clerks of the State of all speed violations. Along the same line there is a new provision requiring the Secretary of State to file with each county clerk a list of registered motor vehicle owners and registered chauffeurs, and to file each 30 days a supplemental list, showing registrations to date, to the end that local authorities may ascertain the identity of persons who violate the law and do injury to others while operating motor vehicles.

Sixth.—Beside the local penalties for violations, which are somewhat more severe than those at present in force, it will be possible to annul the certificate of registration of any vehicle that uses a fictitious number, and to suspend, for a period of time, the right of any chauffeur to operate any motor vehicle in case of convictions. In addition there is a provision making it a misdemeanor for any person to tamper with or use a motor vehicle without the consent of its owner. This provision will be much appreciated.

This bill is the result of many conferences between leading members of the legislature and representatives of the New York State Automobile Association, and it is thought to give effect to an understanding between representative interests, whereby the present law shall be brought up to date and made more easily enforceable, and whereby the motor vehicle users of the State acquiesce in the payment of an annual registration fee for the express purpose of maintaining improved highways.

OHIO LEGISLATORS WANT INCREASED FEES.

COLUMBUS, O., March 16.—Evidently the members of the Ohio legal mill are in favor of grinding more out of the owner of an auto than they have hitherto succeeded in doing, as the Ward bill, which calls for a license fee of $3 for cars of 12-horsepower or less, $5 up to 20-horsepower, $10 up to 50-horsepower and $15 above that, has already passed the Senate, and is now before the lower house. Dealers' licenses are to cost $10 for each type of car, and chauffeurs' licenses will cost $2, while fines of $25, $50 and $100 and 30 days' imprisonment are provided for repeated offenses. These penalties are not alone for speed or registration violations, but also refer to the sections covering equipment, such as lamps, horn, etc., and compliance with rules of the road. The speed limits are 8, 15 and 20 miles an hour, respectively, according to the nature of the district, and reciprocal rights are granted to non-residents registered in their home States. Special penalties of a fine up to $300 and 60 days' imprisonment are provided for carrying a fictitious number; $100 and suspension of license for two years for failure by chauffeur to register, and $200 for unwarranted use of another's car.

MICHIGAN'S STATE LAW NOT WELL ENFORCED.

DETROIT, MICH., March 17.—Some of those who hailed with loud acclaim the law requiring all owners of automobiles to secure a State license, thus taking the matter out of municipal control, are beginning to wonder whether, after all, the move was as good as at first supposed. Detroit's board of assessors, after struggling with the problem in an endeavor to get owners on the personal tax roll, are convinced the plan is not an unqualified success. Either the addresses of many owners were erroneously given to State officials or little care was exercised in making the entries, for, from the records, it is impossible to locate many owners.

Automobile owners have likewise shown a laxness, neglecting to notify the Secretary of State when they disposed of a car, so that the change could be made. As a result, many are credited with owning from three to five cars, when they have disposed of nearly all of them. Many mixups have already resulted, and further trouble is anticipated when it comes to collecting on the assessments made, owing to the difficulty of determining ownership.

QUAYLE HEADS NEW YORK ASSOCIATION FOR THIRD TERM

BUFFALO, March 13.—Something not entirely unexpected in view of recent developments came out at the meeting of the New York State Automobile Association, held in the rooms of the Automobile Club of Buffalo yesterday. The announcement was made of the secession of the Automobile Club of America from the State Association. This action is the culmination of a series of differences that have existed for some time, with a strong degree of unpleasantness, between the New York club and the State body of the national association.

From what was ascertained locally, the New York club has been chafing under the restraint of the national and State bodies with which it is affiliated. One immediate cause assigned is the bill which the legislative committee of the New York State Automobile Association has drawn up. This bill is a model one in many respects. It provides that automobiles shall be exempt from taxation as personal property, but shall annually contribute a registration fee to the State on the basis of $2 for the first 1,000-pound weight, and 25 cents a hundred for each additional hundred pounds. This measure would bring about $350,000 in revenue to the State each year.

Officers and Directors New York State A. A. at Buffalo.

The group includes President Oliver A. Quayle, Albany; Secretary Chauncey D. Hakes, Albany; Frank B. Hower, H. A. Meldrum, Dal H. Lewis, Norman M. Pierce, and Mr. Weaver, Buffalo; M. L. Ruder, Albany; J. W. Snowden, Peekskill; H. H. Franklin, Syracuse; D. A. Burtiss, Schenectady; S. C. Tallman, Auburn; George Forbes, Olean; L. H. Babcock, Norwich; J. B. McMurrick, Oswego.

There is a story current here that A. R. Shattuck, one of the governors of the A. C. A., entertained some of the Albany legislators at the Fort Orange Club in Albany, and told them that the proposed registration in the A. A. A. bill was too cheap for an automobile, and "his organization," the A. C. A., would stand for a yearly tax of from $4 to $40, according to the weight of the car. The Albany legislators routed up the legislative committee of the State association and demanded to know what was meant by proposing a tax of from $2 to $4, when "those rich fellows in New York were willing to pay as high as $40 apiece." It was then the work of the State association to show who was representing the automobilists of the State, the 35 clubs affiliated with the A. A. A., and extending from Yonkers to Buffalo, or the inside ring in the A. C. A. of New York City.

President O. A. Quayle, of Albany, maintained that Shattuck and the several governors of the A. C. A., who always attend meetings, never represented that organization. However, Shattuck got busy, and kept at it until he got the resignation of the A. C. A. offered. When the resignation was presented, a resolution regretting the action of the A. C. A. was adopted, and the paper laid on the table. President Quayle made the declaration that before any law is enacted taxing an automobile any $40 a year, it will have to pass over his dead body. He asserts that he will resign before he will stand for anything like that. The attitude of President Quayle was endorsed by President F. B. Hower, of the local club.

Officers of the State organization elected yesterday were: Oliver A. Quayle, re-elected for the third time as president; Charles Jerome Edwards, of the Long Island Automobile Club of Brooklyn, vice-president; C. D. Hakes, Albany, secretary, and N. M. Pierce, Buffalo, treasurer, the accompanying photograph showing the officers.

The meeting approved the bill providing for highway improvement; also the State Motor Vehicle measure, drafted by the State Automobile Association. At the conclusion of the meeting the members were entertained by the members of the local club at a dinner at the Buffalo Club. Later, all attended the automobile show, held here this week. Further developments in the situation may be forthcoming at any time.

PRES. QUAYLE ISSUES STATEMENT ON A. C. A. MATTER

PRESIDENT OLIVER A. QUAYLE, of the New York State Automobile Association, has issued the following statement in relation to the differences between that body and the Automobile Club of America, relative to the matter of dues:

The constitution of the New York State Automobile Association provides, in the matter of dues, that they shall be paid bi-annually, at the rate of $1.00 per club member, except that when a club shall have a membership in excess of 500 members, then no dues shall be paid upon such excess membership. The total club membership of the State Association at this time is approximately 6,000 members. Of this number 737 members of the Automobile Club of America have not paid dues, the Automobile Club of America paying no dues upon its membership in excess of 500. Seven hundred and twenty members of the Automobile Club of Buffalo have paid no dues, the Automobile Club of Buffalo paying no dues upon its membership in excess of 500.

The Automobile Club of Buffalo, recognizing the apparent injustice of such a provision, offered an amendment to the constitution, which would require all clubs to pay the same dues. As the number of clubs in the State Association is increasing, and as the membership in these clubs is likewise rapidly increasing, it has been necessary for me to explain upon many occasions why a club of 400 members were required to pay $400 a year, when a club of 1,200 members were required to pay but $500 per year.

This proposed amendment to the State Constitution is not for the purpose of increasing revenue. The State Association has no need for funds at this time, its income being entirely sufficient. It is merely intended to make more equitable the present provisions of the Constitution relative to dues, by requiring its 1,500 non-paying members (737 of which are represented by the non-paying membership of the Automobile Club of America and 720 by the non-paying membership of the Automobile Club of Buffalo) to pay dues, and reducing the dues from $1.00 to 75 cents for all clubs.

The income of 75 cents per member on the association's full membership would produce a revenue equal to the dues of $1.00 per member, on its present dues paying membership, leaving the State Association's annual income practically identical, and yet reduce the dues of club members 25 per cent.

The State Association, while mindful of the influence and prestige of its largest clubs, must give due regard to the small ones.

The club dues in every automobile club in the State of New York at this time (with two exceptions) is $5.00 per year per member. Clubs are now paying the State Association $1.00 per year per member, or one-fifth of their revenue. If, therefore, their dues in the State Association could be reduced to 75 cents, they would be relieved of a considerable burden.

Therefore, I cannot reconcile myself in the belief that the resignation of the A. C. A. is precipitated over a matter of $300 or $400. Again, my personal acquaintance with many of the members of the A. C. A. is such that I know that an item of $300 or $400 could not occasion a difference of opinion. On the other hand, I am inclined to think that the real differences are over a matter of legislation, and I may desire to make a further statement in connection with the legislative situation after the convening of the legislature on Monday next.

HOTCHKISS SAYS NO SINGLE CLUB CAN LORD IT OVER OTHERS

RELATIVE to the resignation of the Automobile Club of America from the New York State Automobile Association, President William H. Hotchkiss, who was in New York last week, when asked his views, said:

"While the difference between New York's local club and the State Association proper, which is a body of forty clubs, including one at Buffalo as large as the local club here, have been brought to a head by the contemplated action of the State body, requiring the New York club to pay dues on a per capita basis of its full membership, the breach dates well back, and was opened by a conflict over matters of State policy in legislation.

"It is, perhaps, proper for me, as president of the American Automobile Association, to say that I do not regret the resignation, but welcome it. It is high time that motorists understand whether a mere name adopted in the infancy of the motor vehicle in this country, and which has since become a misnomer, entitles any local club in any city, no matter how great, to lord it over hundreds of other clubs in other parts of the country. Indeed, the time has now come to determine whether the American Automobile Association represents those motorists or whether they are to be represented by a small clique of gentlemen who manage a local social club. I, therefore, hail the issue, and have no doubt of the result.

"The American Automobile Association is now composed of twenty-one State organizations, with an application in from the twenty-second State, and is represented by clubs in almost every State where motoring is general. It has absolute control of the sport in this country, and of all touring and technical contests, to say nothing of its premiership in matters of legislation, both national and State."

W. K. VANDERLILT, JR., UPHOLDS A. A. A.

Before leaving for his home in Buffalo, after returning from the legislative hearing at Washington, President William H. Hotchkiss, of the American Automobile Association, received assurances from William K. Vanderbilt, Jr., that he had no intention of withdrawing as a director of the Three A's, and that he would continue loyal to its interests, despite the withdrawal of the Automobile Club of America from the State Association, which carries with it a resignation from the A. A. A. Discussion of the situation has brought out the fact prominently that many of the members of the Automobile Club of America are not entirely in accord with the recent action of the club's governing board, and from his statement, Mr. Vanderbilt would appear to be one of these.

MARYLAND GOOD ROADS BILL TO PASS.

ANNAPOLIS, MD., March 16.—The good roads bill, which was recently introduced in the Senate by Senator Benson, and which, when passed, will give Maryland the best State roads in the country, has been approved by Governor Crothers, and will doubtlessly be passed this week. An amendment was offered to the bill by Senator Linthicum, which provides that all turnpikes near the city where toll-gates are located, and which are controlled by corporations, be condemned under the provisions of the law. Among those who were instrumental in having the bill brought before the legislature were the automobile clubs of Baltimore and Washington.

The idea of the Governor is to appoint a paid commission of six, three to be appointed by him and three to be taken from the Geological Survey. The Governor said that the work would be done under State control and under State supervision. The Governor, who is a member of the Survey, will be a member of the commission, and the other two will be Dr. William Bullock Clark and Dr. Ira B. Remsen, president of Johns Hopkins University. The three members are to be paid salaries, while the survey members on the commission will mean that the survey will have something to do with the construction of the roads, provided the paid members agree.

TIRE CHAINS BARRED IN FAIRMOUNT PARK.

PHILADELPHIA, March 16.—At its meeting last Thursday, the Fairmount Park Commission passed a resolution forbidding the use of tire chains on automobiles within the park limits, on the ground that the roads are liable to damage thereby. An exception was made of Belmont avenue, which will permit of Main Line residents and through-route tourists reaching Lancaster pike without removing their chains. To compensate in part for this prohibition, it was decided to substitute asphalt for the rough Belgian blocks on the north side of Girard and Parkside avenues, from the west end of Girard avenue bridge to the Belmont avenue entrance to the park. This will give access to Belmont avenue from the north for cars with chains on.

In this connection, the Quaker City Motor Club has officially protested against the awful conditions around the City Hall, where the Rapid Transit Company is about completing the subway loop. Between mud and Belgian blocks and patchwork asphalt, the going is something fearful, especially in wet weather. Another evil was called to the attention of the city officials—the stretch of Belgian blocks on the "Hump" on Broad street over the Reading Railway tracks at Huntingdon street station. The automobilists ask for an asphalt strip in the center or narrower ones at each side, to do away with the jarring and shaking their cars are subjected to while covering that short stretch.

INDIANA ACTION AGAINST RECEIVER POPE.

INDIANAPOLIS, March 14.—A petition was filed in the United States Court here to-day, asking that Albert L. Pope be removed as receiver for the Pope Motor Car Company. The petition was filed by the Northern National Bank, the National Bank of Commerce and the Bostwick-Braun Company, all of Toledo, and the Capital National Bank of this city. It is stated in the petition that the Pope Manufacturing Company is making a claim of $800,000 against the Pope Motor Car Company. The petitioners state that they are creditors of the Pope Motor Car Company to the extent of $240,000, and that Mr. Pope is negotiating to sell the Indianapolis plant for $400,000, one-fourth or less in cash, and the balance on long time.

EARLY SPRING DOINGS OF THE AUTO CLUBS

A. C. C. ON THE NECESSITY OF ORGANIZATION.

CINCINNATI, March 16.—In the bulletin of the Automobile Club of Cincinnati, the advantages of membership in it are set forth in no unmistakable manner. Among other things said in endeavoring to persuade Cincinnati autoists to join the club are the following:

"There are two things which most deeply concern every user of the motor car. These are **good roads** and **rational legislation.** As individuals, there is but very little that any of us can do in securing either. Collectively, we can exert a powerful influence for both. It has been truly said that in this country the **good roads** question was never spelled with capital letters until the automobilists took hold of it. The automobile clubs throughout the United States are at present exerting a powerful influence in the shape of legislation for highway improvement. Good road officials all over the country recognize in the automobile clubs their best allies in their interests to improve the roads. Sam Houston, State Highway Commissioner of Ohio, came down from Columbus recently, to tell the members of the Cincinnati Club what the State of Ohio is doing now for **good roads,** and to ask the support and influence of the club in his effort to secure legislation by which the State will assume 50 per cent. of the cost of road construction and maintenance all over the State. At the club dinner held that evening, Mr. Houston stated that he found that the members of the automobile clubs were the men on whom he could most rely for support in his measure.

"The necessity of organization and unity of action to secure uniform and rational legislation is only too apparent when we consider that at present not only has each State a different law, but that also in many States one finds that each town has its own peculiar law regulating the use of the motor car, with resulting confusion to the automobile tourist. Automobile legislation will never be solved to the satisfaction of the motorist until, by **unity of action,** we secure uniform laws throughout the different States.

"Membership in the Automobile Club of Cincinnati includes membership in the American Automobile Association and the Ohio State Automobile Association, and the ten dollars paid as dues to the local club also pays the dues of the State and National organizations, and entitles all members of the Cincinnati Club to all the advantages derived from membership in these organizations."

ALBANY CLUB TO HOLD A FIVE-DAY RUN.

ALBANY, N. Y., March 16.—In accordance with the plan it has followed for the past two years, the Albany Automobile Club will hold a five-day run this summer, beginning June 20. The route will be to Greenfield, Mass., the first day; to Providence, R. I., the second day; New London, Conn., the third day, and to New York the fourth, returning to Albany by way of Waterbury, Conn., on the last day of the trip.

In connection with the prosecution of Justice of the Peace Van Ness, of East Greenbush, a suburb of Albany, for misappropriating funds received as fines, and which is being prosecuted by the club, through its attorneys, Bender & Hinman of Albany, a number of wall placards are being distributed to clubs and garages. These bear a request to all autoists who were fined in that hamlet at any time during 1906 and 1907 to communicate with the law firm mentioned, as by so doing they may promote the cause of justice and the welfare of the autoist.

A CLUBHOUSE SOUGHT FOR WILKES-BARRE.

WILKES-BARRE, PA., March 9.—Almost as soon as a suitable site or building can be secured, the Wilkes-Barre Automobile Club will possess its own club premises. One of the best propositions now being considered is the old Wilkes-Barre and Eastern railroad station, on West Market street, and adjoining Nesbitt Park. When improvements have been carried out this building would be an excellent one for automobile club purposes. A scheme has also been brought forward by which the automobile club should co-operate with the recently formed Amateur Driving Club in securing joint headquarters large enough to accommodate both organizations, as this would permit of better facilities being procured.

ACKNOWLEDGES QUAKER CITY M. C.'S OFFER.

PHILADELPHIA, March 16.—Thursday last the Quaker City Motor Club received from the National Government an official reply to its offer to organize an emergency corps of automobilists, to serve in defense of the nation when called upon. The letter from the Assistant Secretary of War follows:

WAR DEPARTMENT.
Washington, March 12, 1908.

H. C. Harbach, Secretary Quaker City Motor Club.

Dear Sir—I have the honor to acknowledge the receipt of your letter of February 22, 1908, addressed to the President of the United States, and inclosing a preamble by your club offering the use of its motors and the services of its members as an auxiliary force to the Federal Government in case of insurrection or foreign invasion. Upon receipt of your letter the President referred it to the War Department for suitable acknowledgment. I beg, therefore, to express the appreciation of the President and of the War Department of your patriotic action in this matter, and to say that, should an emergency of the nature indicated in your preamble arise, the generous offer of your club will be borne in mind.

(Signed), ROBERT SHAW OLIVER.
Assistant Secretary of War.

ARKANSANS ORGANIZE—STATE BODY COMING.

LITTLE ROCK, ARK., March 14.—At a meeting of the automobile enthusiasts of this city, held last Monday afternoon at the Real Estate Exchange, the Automobile Club of Little Rock was organized with the following board of officers: President, Moorehead Wright; first vice-president, J. P. Runyan; second vice-president, J. N. Heiskell; secretary, Irving S. Hirsch; treasurer, Perry Stifft. The officers named, together with E. P. Ladd, C. A. Pratt, J. E. Osborne, W. B. Miller and J. A. Van Etten, constitute the board of directors. The club will be incorporated under the by-laws of the American Automobile Association, and a State body will be formed. Capt. C. A. Pratt has been named as State director, to represent the local body in the national association. It is planned to organize clubs at Fort Smith and Pine Bluff, and perfect the State organization.

FAIR QUAKERITES TO ENDOW A HOSPITAL BED.

PHILADELPHIA, March 9.—For an exceedingly young organization, the Quaker City Ladies' Motor Club is certainly an exceedingly spunky one. With a rather limited membership list, it has set about to endow a bed in the Garretson Hospital for those injured in autoing accidents. They are gathering in the funds quite rapidly, but, to expedite matters, decided at last week's meeting to call on their brothers, husbands and friends in the Quaker City Motor Club to lend a helping hand. The work is now booming, and the "automobile bed" will be a reality within a few weeks.

DELAWARE ASSOCIATION BEGINS ACTIVE WORK.

WILMINGTON, DEL., March 16.—At a meeting held here during the past week the Delaware Automobile Association decided to undertake the work of marking the roads, and will have finger boards giving directions and distances at the intersections of the principal roads throughout the State. This is something in which Delaware has been lamentably lacking. The association has just issued its 1908 year book.

FIRST BANQUET OF YALE AUTOMOBILE CLUB.

NEW HAVEN, CONN., March 16.—The first annual banquet of the Yale Automobile Club will be held at the University Club next Wednesday evening, and will mark the opening of the auto season for 1908. Hill-climbing contests and race meets at the Branford Driving Park will follow. The Yale club is one of the largest of its kind in the East.

The Thomas Crossing Medicine Bow River, Wyo.

Buffalo Bill's Daughter Greets the Thomas at Hershey, Neb.

Through Snowdrift near Rock River, Wyo.

THOMAS CAR CROSSES NEVADA LINE.

COBRE, Nev., March 17.—The Thomas New York-Paris car reached this place at 8:48 P. M. to-day, making 182 miles from Ogden, Utah. Sandstorms were encountered, which, owing to unsuitable goggles, made driving very difficult.

Upon arriving at Cheyenne, Wyo., Montague Roberts, the Thomas driver who has made such a successful fight against odds that have kept his foreign competitors far to the rear, relinquished command of the car in order to return to New York, as he is scheduled to drive in the Briarcliff trophy race and other events of the season. E. Linn Mathewson took charge, and drove the car as far as Ogden, Utah, which was reached last Tuesday, where he turned the Thomas over to Harold Brinker, of Denver, who will take it through to San Francisco, Captain Hansen, late of the De Dion team, having signed on to cover the Alaskan and Siberian portions of the route. The Thomas arrived at Bitter Creek, Wyo., on Wednesday of last week, having covered 2,300 miles, its closest competitor, the Zust, then being 422 miles in the rear. The river is 15 feet deep at Bitter Creek, the wagon bridge was down, and it was too risky to try the railroad bridge, so, after struggling down the steep bank, the car was run across on the ice, which was eight inches thick. Granger, Wyo., was reached Thursday night, having covered ninety miles, in spite of the fact that the Thomas crew and car have frequently been called upon to come to the rescue of the pilot car. At Thayer Junction, it was necessary to ford Bitter Creek, as the ice was not strong enough, but the Thomas plowed through two feet of mud, water and floating cakes of ice without any trouble.

At 10:45 P. M. Friday, the Thomas rolled into Evanston, Wyo., making its total mileage 2,460. Some forty-odd miles of this were covered over the Union Pacific right of way, including a run through the tunnel at Aspen Ridge, saving many days' work of snow shoveling, as the drifts in the mountains, which are 9,000 feet high, reached ten feet in depth. Saturday's total was disappointing, ten hours' fighting through snow and mud only advancing the car 20 miles, but no stop was made, and after 25 hours' continuous running, the Thomas arrived at Ogden at 9:30 A. M.

At that time the Zust was at Rawlins, Wyo., the De Dion at Omaha, Neb., the Protos at Ames, Ia., and the Motobloc at Tama. This gave the Thomas a clear lead of 310 miles, but before leaving Ogden at four the next day, the Zust had cut this down to 226 miles, and the others had advanced from 60 to 98 miles, the Protos making the best showing. The mileage for the last seven days is as follows:

Car. Country.	Day. 29.	Day. 30.	Day. 31.	Day. 32.	Day. 33.	Day. 34.	Day. 35.
Thomas (America)	2,300	2,390	2,460	2,480	2,536	2,536	2,718
Zust (Italy)	1,878	2,052	2,109	2,186	2,226	2,310	2,360
De Dion (France)	1,386	1,516	1,524	1,524	1,536	1,582	1,690
Protos (Germany)	1,262	1,332	1,369	1,369	1,369	1,467	1,536
Motobloc (France)	1,101	1,181	1,263	1,262	1,313	1,394	1,439

MOTORING A LA CHAFFRAY.

Saint Chaffray announced that he would ship his car by freight to Seattle on March 5, to catch the steamer to Valdez. He stated that the first car to arrive in Paris would be the winner. Roberts says he does not propose to make a freight contest of the New York-to-Paris race.—News item.

"Arouse, brave comrade, Autran;
There's work to do, allons!
Make haste with boards and hammer
To crate the De Dion.
A bas! the frightful highways
That wrought us much dismay!
We tour henceforth by freight car,"
Quoth Bourcier Saint Chaffray.

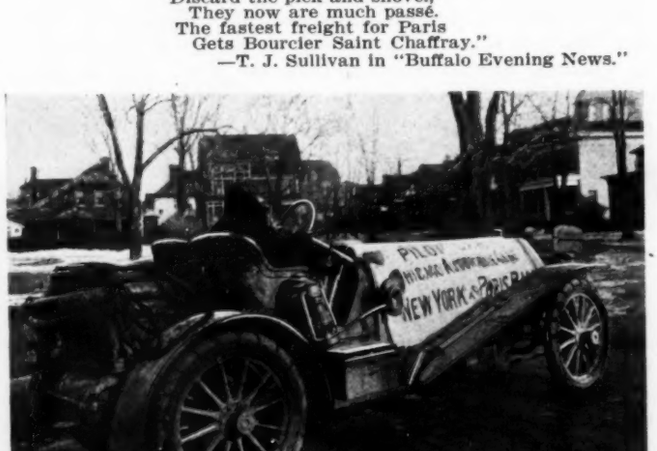
"Before us rise high mountains
Our onward way to bar,
Those Rockies and Sierras
Reject our touring car.
But courage, my brave Autran!
Behold, a better way!
We'll scale them on a flat car,"
Says Bourcier Saint Chaffray.

"The wilds of dire Alaska
Shall not us terrorize;
Though trails comprise the highways
And snowdrifts touch the skies.
A railroad goes from Valdez;
Will it not be au fait
To motor in a box car?"
Asks Bourcier Saint Chaffray.

"Those drear Siberian tundras
Where Desolation reigns
Shall daunt not Bourcier's courage
But yield to Bourcier's brains.
That Trans-Siberian Railroad
From snow is clear by May—
We'll go by freight to Moscow,"
Cries Bourcier Saint Chaffray.

"Then hasten, my brave Autran!
Pack up the broken springs,
Collect the drive-shaft fragments
With other injured things.
Discard the pick and shovel,
They now are much passé.
The fastest freight for Paris
Gets Bourcier Saint Chaffray."

—T. J. Sullivan in "Buffalo Evening News."



When the Gearless Returned Home from Its Piloting Trip.

Arrival of the Gearless Greyhound at Rochester from Chicago after having acted as pilot car for the New York-Paris contestants. Distance cvoered, over 1,800 miles.

NEXT WEEK INDIANAPOLIS HOLDS FORTH.

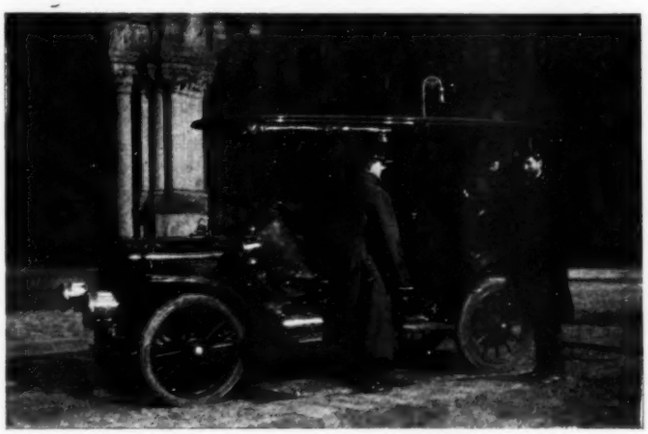
INDIANAPOLIS, March 17.—Practically all arrangements have been completed for the second annual automobile show, which begins next Monday and will continue throughout the week.

Because there is no building large enough for a combined show, each dealer will exhibit in his own garage, from where special demonstrations will be made. Factories will also keep open house, and tire and accessory manufacturers are arranging for special demonstrations.

There will be a number of public events during the week, in which dealers and drivers from all parts of the State will unite. On the opening day there will be a parade, in which at least 200 automobiles will participate. It will be headed by the police automobiles and a five-ton truck carrying a band. Each automobile appearing will bear a card of uniform size, giving the name of the car, price and the local agent.

On Tuesday morning, at 11 o'clock, the hill-climbing contest will be held at Michigan Hill, northwest of the city. There are about fifty entries, and a special contest has been arranged for trucks and delivery wagons.

The obstacle race, on Friday afternoon, will be held on the Capitol Avenue boulevard, and about forty entries have been made. The closing feature will be a love feast and smoker at a local hotel for the dealers.



Governor Hughes Entering White Steamer, Boston.

Last week New York's Governor visited the Hub, and did all his traveling in the White car, placed at his disposal by the local reception committee.

ELMORE SHOWS STRIKING ECONOMY FIGURES.

With a view to demonstrating beyond the shadow of a doubt the economy of the Elmore car, the makers selected 16 Elmore owners at random from those in Detroit, Mich., for the purpose of ascertaining exactly what their expenses had been for repairs. These 16 owners had traveled a total of 132,650 miles, and in covering that tremendous distance had expended all told, for repairs, the sum of $26.95. The following gives the distances covered and the repair cost in each instance. All the owners are residents of Detroit:

Miles.	Years in Use.	Repairs.	Owners.
12,000	1	$1.05	Dr. E. B. Smith
6,500	1	.05	Dr. F. S. Kiskadden
4,800	1	.50	Chas. W. Munz
5,000	1	.10	Dr. F. W. Young
8,500	2	.75	John K. Smith
7,200	1	1.35	Miss Mabel Wright
7,000	1	1.60	W. H. Allen
4,750	1	1.10	W. F. Barr
8,000	1	1.00	M. Caley
8,200	1	.50	John Trost
10,000	2	5.75	F. Peckencher
6,200	1	.25	Mat. Heldrath
18,000	2	5.90	J. J. Miller
3,500	1	.50	Perry Hibbard
14,000	3	4.75	Thos. H. Van Loch

"Sealed-Bonnet" Mora Wheel Deep in the Snow.

MORA CAR'S STRENUOUS WINTER TRIP.

Not content with having some 8,000 miles under sealed-bonnet conditions last season to its credit, the Mora car, which successfully took part in the first sealed-bonnet contest run by the Automobile Club of America, and every one since then, was started from Rochester, together with the New York-Paris contestants. The Mora met with several accidents last summer, such as the smashing of a wheel, breaking of the steering gear connections and part of the radiator, but repairs to these parts were carried out without interfering with the original seals placed on the bonnet by the officials of the Chicago Motor Club last June. The Mora left Rochester at noon on February 16, in company with the Zust, but as the latter went into a shop for repairs, the Mora kept on to Buffalo, where it joined the Thomas and De Dion the same afternoon.

The story of its trip westward from Buffalo is that of a continuous struggle against almost overwhelmingly adverse conditions for every step of the way, during the course of which the Mora crew and car used their efforts in helping out first one and then another of the contestants in the New York to Paris run. On one day the total distance covered was seven miles. Chicago was finally reached, after many mishaps and hardships, and the day following the arrival of the Mora, the technical committee of the Chicago Motor Club, who sealed the bonnet last June, inspected the seals and certified that they had not been disturbed since originally placed on the car on June 19, 1907, so that the Mora was enabled to add 650 miles to its world's record of 8,000 miles under sealed bonnet conditions. Some idea of what the going was like for a large part of the way may be gained from the photograph showing the car almost out of sight in the snow.

The Mora Arriving at the Chicago Automobile Club.

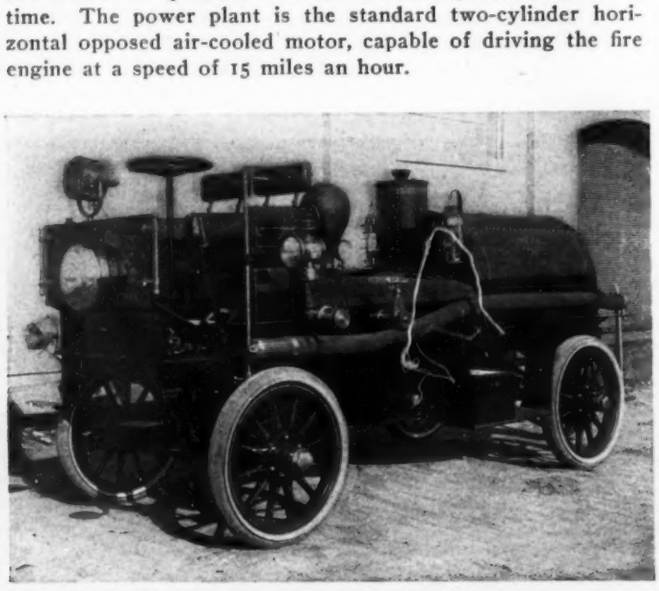
Studebaker Delivering Message to Col. Loughborough.

SUCCESSFUL TRIP OF THE STUDEBAKER.

For the last few hundred miles of its trip, the Studebaker car and its crew, which were sent on a war mission, bearing dispatches from General Grant at Governor's Island, New York City, to Colonel Loughborough at Fort Leavenworth, Kan., received one continuous ovation. Farmers had notice of their coming well in advance, and lined the roads to see them pass, flags being displayed at various places. At Atchison they were accorded an elaborate reception, including a banquet. This point was reached at four o'clock in the afternoon, and the drivers were compelled to halt for a few hours. Fort Leavenworth was reached before noon the next morning, and the dispatches formally delivered to the commandant of the post, as shown by the accompanying photograph. Just to show that the Studebaker was as good as ever, Jack Huge drove it to Kansas City, through 26 miles of mud, in an hour and a half, on the following day.

FIRE FIGHTER FOR PENNSYLVANIA BRIGADE.

Massachusetts and Minnesota have united in the production of the automobile fire engine recently handed over to the Radnor Fire Company, of Wayne, Pa. A stock model D-6 chassis, manufactured by the Knox Automobile Company of Springfield, Mass., furnishes the power necessary to reach the scene of operations in the shortest possible space of time. The power plant is the standard two-cylinder horizontal opposed air-cooled motor, capable of driving the fire engine at a speed of 15 miles an hour.



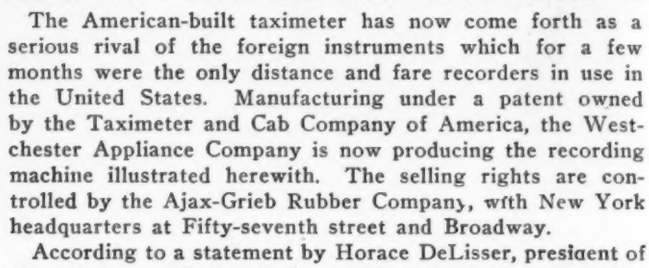
The Knox-Waterhouse Automobile Fire Engine.

On this chassis the Waterhouse Engine Works Company, of St. Paul, Minn., has mounted a water-cooled four-cylinder vertical 45-50-horsepower motor, directly connected to one of their rotary pumps having a capacity of 360 gallons per minute. The weight of the entire outfit, including suction hose, play pipes, etc., is 6,200 pounds.

AMERICAN TAXIMETERS NOW ON THE MARKET.

The American-built taximeter has now come forth as a serious rival of the foreign instruments which for a few months were the only distance and fare recorders in use in the United States. Manufacturing under a patent owned by the Taximeter and Cab Company of America, the Westchester Appliance Company is now producing the recording machine illustrated herewith. The selling rights are controlled by the Ajax-Grieb Rubber Company, with New York headquarters at Fifty-seventh street and Broadway.

According to a statement by Horace DeLisser, president of the company, a first order for 2,600 of these taximeters has been received, each instrument working at a tariff of 50 cents a mile. A further order is said to be pending for a series of instruments working at the New York rate of 30 cents for the first half mile, 10 cents for each additional quarter, and 10



Views of the New Ajax-Grieb Taximeter, "Vacant" and "Engaged."

cents for every six minutes of waiting. The Ajax-Grieb taximeter records the number of trips, the total cash for the day, total number of miles covered, and each individual fare.

TRADE LITERATURE THAT HAS COME TO HAND.

Maxwell-Briscoe Company, Tarrytown, N. Y.—"Faith and Its Realization, the Story of an Industrial Accomplishment," is a narrative of more than usual interest, dealing with the history and beginnings of the Maxwell-Briscoe factory at New Castle, Ind. There are some excellent illustrations of scenes at the inauguration of the factory, when Vice-President Fairbanks, himself a native of the State of Indiana, laid the corner stone and made an address upon the rapid development of the national industries and the solution of national problems.

New York Gear Works, Brooklyn.—Without undue verbosity, but sufficiently in detail to suit the motor boat enthusiast, and illustrated sufficiently to make it readily comprehensible, this company presents its Ball improved reverse gear for marine work. Included are tables of dimensions giving weights and prices of the different gears, as well as other data required for the selection of a gear to suit the requirements of certain sizes and types of engines and boats.

York Motor Car Company, York, Pa.—A study in brown and gold has been adopted as the cover of the new catalogue of the Pullman car, manufactured by the York Motor Car Company. The catalogue stands high as a trade publication, giving just the information desired by automobilists and prospective buyers and being artistically produced.

BRIEF ITEMS OF NEWS AND TRADE MISCELLANY

On March 12, at Milwaukee, S. W. Hartley, designer of the Cleveland car, driving "Old Scout," the first of the 1908 Cleveland cars, came in victorious in the three-day endurance run. As it was the first of its kind, this Cleveland has been used as a testing car ever since its completion and has covered more than 30,000 miles since last August.

According to figures given by the Quaker City Automobile Company, of Philadelphia, the average cost of repairing Franklin cars during a period of fifteen months has been $7.50. The company guaranteed to repair all 1907 model Franklins free of charge from October 1, 1906, to January 1, 1908, and the low figure in question represents the cost of living up to their guarantee.

Much has been said and far more written concerning the care of pneumatic tires, but it is a subject that cannot be overdone, so that the booklet just issued by the Goodyear Tire & Rubber Company, of Akron, O., entitled "The Care of an Auto Tire," is timely. That it is likewise to the point goes without saying, as it contains the experience of skilled tire makers and users condensed for practical use.

The Logan Construction Company, of Chillicothe, O., has been shipping a large number of trucks recently to representative houses, among them a Model T ton truck to the Allen Carpet Cleaning and Rug Weaving Company, Buffalo, and another of the same model to Peter Peterson, furniture mover, Milwaukee, Wis. Inquiries for commercial cars are reported as plentiful in the Central and Middle West.

A. P. Henley, traveling representative of the H. H. Franklin Company, who has just returned from an extended trip to the Pacific Coast, says that farmers are buying automobiles. Crops were good last year, prices were high and the farmers have money. The owners of the big ranches find there is nothing to equal the automobile for covering the ground effectively and they are buying machines that are built to stand the racket.

"The Fairweather Club" is the title of a recently formed "eating" organization mainly composed of prominent agents and branch managers of New York's "automobile row." It will give its second dinner in honor of Colonel K. C. Pardee, the Maxwell distributor, at the Hotel Cumberland, Fifty-fourth street and Broadway, April 1. Henry M. Duncan, of the J. B. Brewster Co., will preside, and among the speakers will be Messrs. Cresswell, McLaughlin, John S. Crosby and Colonel Pardee.

The H. H. Franklin Company, Syracuse, N. Y., last week awarded as a prize a fine gold watch to Irving R. Gardiner, superintendent of the auto department of C. H. Childs & Company, Utica, N. Y. The contest was open to all Franklin dealers, the prize being offered for the best ten reasons why a buyer should select the Franklin. Mr. Gardiner's reasons were as follows: "Durability, beauty, elasticity, reliability, air-cooling, accessibility, economy, lightness, high-power and pre-eminence, a short statement being given under each one of these heads.

The businesses operated by the United States Automobile Company, on Plymouth avenue, and Fred Mabbett, on Main street, Rochester, N. Y., have been consolidated under the name of the former, and Mr. Mabbett will be general manager. The company's capital stock has been increased from $200,000 to $400,000, and the officers are: President, Harry S. Woodworth; vice-president, J. Foster Warner; secretary-treasurer, Charles F. Garfield. The company's establishment on Plymouth avenue is the largest of its kind in New York State outside of the metropolis.

W. E. Flanders, former general factory manager for the Ford Motor Company, and Thomas Walburn, former superintendent of the same concern, have recently become associated with the Wayne Automobile Company, Detroit, Mich., as stockholders. A reorganization of the latter company, has been effected, B. F. Everett still remaining at its head, and with Messrs. Flanders & Walburn, having the management of the concern. Mr. Everett is still president and sales manager, while Mr. Flanders will act as general manager. C. L. Palms, Dr. J. B. Book and William Kelly, who were heavily interested in the old company, remain as stockholders. It is proposed to manufacture on a larger scale than hitherto.

Harry G. Smith, of the Cleveland branch of the Diamond Rubber Company, who had charge of the Diamond supply car in the A. A. A. tour last summer, is captain of the Diamond tire camp on the course at Savannah for the races this week. Twelve of the seventeen cars entered are equipped with Diamond tires, and all but two also use the Diamond demountable rim. The rules require that the driver of the car or his mechanician must make any necessary tire changes, and there will be little for the Diamond crew to do excepting to supply such equipment as may be found necessary. The machines using the Diamond product include the Appersons, Stearns, Thomas Detroits, Thomas Flyer, Lozier, Pennsylvania and American.

NEW AGENCIES ESTABLISHED.

Logan commercial cars and the semi-racer runabout will be represented in Rochester, N. Y., by A. Vernon Hart, one of the best known dealers in that city.

Among the new agencies recently established by the Franklin Company to handle the Franklin air-cooled cars during the coming season are the Fruit-Ohl Company, Sharon, O.; E. T. Byram, Galesburg, Ill.; Colonial Motor Car Company, Springfield, Mo.; Salina Automobile Company, Salina, Kan.; Montana Lumber Company, Lewiston, Mont., and E. R. Nelson, Ishpeming, Mich.

RECENT TRADE REMOVALS.

The Philadelphia G & J Tire agency, of which Sanders Levy is treasurer and F. Berrodin, manager. has moved into new and much larger quarters at 713-715 Broad street. A feature of the new establishment is one of the largest and most completely equipped tire repair shops that the Quaker City can boast of.

During the past week the Philadelphia branch of the Ford Motor Company moved into its new three-story building at 250-254 North Broad street. The building is practically fireproof and affords no less than 40,070 square feet of floor space, so that the new home of the Ford can hold its own even with the most palatial establishments of the Quaker City's "gasoline row." The first floor is devoted to a salesroom, offices and garage, while the second is given over to a stockroom and the third is occupied by a large repair shop.

PERSONAL TRADE MENTION.

Harry S. Houpt, president of the Harry S. Houpt Company, New York representatives of the E. R. Thomas Motor Car Company, of Buffalo, has just returned from a sojourn in Colorado and New Mexico, where he has been spending the winter in recuperating. Mr. Houpt has returned very much benefited in health and will immediately assume personal charge of the Thomas selling end of this territory.

E. Le Roy Pelletier, former publicity man of the Ford Motor Company, is back after a seven-weeks' trip abroad, and after taking a look-in at the Boston show, went west to the scene of his former activities to look after publicity business. It is understood that the former Detroiter successfully closed negotiations for handling the Maxwell business before going abroad, and upon his return from the West will establish himself in New York City. According to Mr. Pelletier, the New York to Paris race, which has always appeared to Americans in a humorous light, is going to be the cause of much sorrowing on the other side. It was confidently expected to prove the overwhelming superiority of the European cars and bolster the falling market for them in this country. Mr. Pelletier spent three years in Alaska and laughs at the idea of trying to drive a car there.

DEATH OF ROBT. M. PRATT.

Robert M. Pratt, assistant secretary of the Worcester (Mass.) Automobile Club, and widely known throughout Eastern Massachusetts as a newspaper man, died suddenly after a short illness, on Thursday of last week. He was a son of the late Major J. Wheelock Pratt, and was born at Sterling, Mass., forty-six years ago. He is survived by his widow, mother and brother.

NEW TAXICABS FOR NEW YORK.

Under the title of the Knickerbocker Taximeter Cab Company, a corporation has been organized with $15,000 capital to operate taxicabs in New York City. The directors are William B. Hurlbut and Sanford J. Wise, of the Garford Motor Car Company of New York, and Stewart H. Elliott, of 1183 Broadway, New York. The parent Garford Company is now completing 100 20-30-horsepower special chassis for this service, and they will be fitted up in a manner much superior to the cabs now in use. They will be of the landaulet type and it is expected that this first lot will be placed on the New York streets by April 15. Later the company will extend its operations to Boston, Baltimore and Philadelphia. Further details of its plans and a technical description of the cars to be used will be given later.

INDEX TO ADVERTISERS

Abrams-Mason Co. 87
Acetylene Gas Illuminating Co. 71
Acme Motor Car Co..... 68
Adams Co. 68
Add-Wear Auto Tire Sleeve Co. 69
Aerocar Motor Co..... 68
Ajax-Grieb Rubber Co..... 69
Almy Water Tube Boiler Co... 56
Am. Brass & Alum. Works... 65
Amer. Motor Car Sales Co.... 72
American Locomotive Motor Car Co. .....Cover
Anderson Forge & Machine Co. 65
Angier Co. 82
Apperson Bros. Automobile Co. 90
Appliance Mfg. Co..... 55
Ashtabula Bow Socket Co..... 66
Atlas Motor Car Co.....101
Auburn Automobile Co..... 68
Audel & Co., Theo..... 76
Aurora Motor Works..... 68
Austin Automobile Co..... 76
Auto Pump Co..... 56
Auto & Supply Co..... 56
Autocar Co. 95
Automobile Supply Co..... 56
Automobile Trade Directory... 72
Automobile Utilities Co..... 56
Auto-Shine Co. 56
Auxiliary Spring & Vent-Button Co. 66
Avery Portable Lighting Co... 79

Baldwin Chain & Mfg. Co.... 91
Banker Bros. Co..... 85
Barndt-Johnston Auto Supply Co. 66
Barnett Drop Forging Co..... 79
Beaver Mfg. Co..... 94
Behen-Faught Motor Car Equipment Co. 67
Beloit Supply Co..... 67
Biddle & Smart Co.....Cover
Black Mfg. Co..... 72
Blasier Mfg. Co., M. E..... 66
Bliss-Chester Co. 56
Blomstrom Mfg. Co..... 79
Boker & Co., H..... 65
Borbein Auto Co..... 75
Bosch, Robert 100
Boston Auto Gage Co..... 77
Bowers Co., F. E..... 74
Bowser & Co., S. F..... 71
Boyle & Co., John..... 97
Bridgeport Vehicle Co..... 66
Brown, Wm. W..... 56
Brownell Motor Co., F. A..... 70
Brush Runabout Co..... 92
Buckeye Jack Mfg. Co..... 82
Buckeye Mfg. Co..... 68
Buffalo Carburetor Co..... 82
Bullard Automatic Wrench Co. 84
Bullard Specialty Co..... 67
Buob & Scheu..... 66

Cadillac Motor Car Co..... 68
Cameron Car Co..... 64
Canton Drop Forge & Mfg. Co. 65
Capitol Auto Co..... 66
Case & Hechinger..... 71
Champion Co., A..... 84
Clark, E. S..... 56
Cleanola Co. 70
Coes Wrench Co..... 50
Colgan Co., J. W..... 74
Comptoir d'Innovations pour Automobiles 67
Conn. Tel. & Elec. Co..... 86
Connecticut Steel & Wire Co.. 66
Continental Caoutchouc Co.... 93
Continental Motor Mfg. Co.... 70
Cook's Sons, Adam..... 80
Corbin Motor Vehicle Corp..... 83
Corcoran Lamp Co..... 74
Cornish-Friedburg Motor Car. 68
Correspondence School of Motor Car Practice..... 55
Cotta, Chas. 67
Cowles & Co., C..... 56
Crane Puller Co..... 85
Crown Battery Co..... 81
Crown Soap Co..... 79
Cullman Wheel Co..... 65

De Luxe Motor Car Co..... 68
Detroit Steering Wheel Co.... 94
Diamond Chain & Mfg. Co.... 65
Diamond Rubber Co..... 96
Dietz Co., R. E..... 75
Dixon Crucible Co., Joseph... 78
Dorris Motor Co..... 83
Dover Stamping & Mfg. Co... 84
Dow Portable Electric Co..... 55
Duplex Co. 67

Earl Motor Car Co..... 63
Echo Horn Co..... 85
Eclipse Machine Co..... 56
Edmunds & Jones Mfg. Co.... 92
Eldredge Electric Mfg. Co.... 67
Elite Mfg. Co..... 61
Ellsworth, J. M.....108
Elmore Mfg. Co.....103
Empire Automobile Tire Co.... 67
Empire Wheel Works..... 66
Excelsior Supply Co..... 77

Fairmount Engineering Works. 68
Firestone Tire & Rubber Co... 69
Fisk Rubber Co..... 98
Flentje, Earnest 71
Forest City Motor Car Co.... 95
Franklin Mfg. Co., H. H.....109
French Mfg. Co..... 77
Fry, T. C. & W. L..... 56

G & J Tire Co..... 76
Garford Motor Car Co..... 68
Gearless Transmission Co..... 91
Geiszler Bros. 55
Gemmer Mfg. Co..... 81
General Accumulator and Battery Co. 55
Gibney & Bros., Jas. L..... 57
Gilbert Mfg. Co..... 74
Goldberg Motor Car Devices Mfg. Co. 59
Gray-Hawley Mfg. Co..... 82
Gray & Davis.....Cover
Grout Bros. Auto Co.....106

Ham Mfg. Co., C. T..... 81
Hans Co., Edmund E..... 86
Hardy Co., The R. E..... 56
Harris Oil Co., A. W..... 56
Hartford Rubber Works Co.... 58
Hartford Suspension Co..... 70
Hatcher Auto Parts Co..... 80
Hatfield Motor Vehicle Co.... 68
Haws, Geo. A..... 57
Haynes Automobile Co..... 91
Healy Leather Tire Co..... 69
Heinze Electric Co..... 71
Hercules Auto Specialty Co... 86
Herz & Co..... 69
Hess-Bright Co. 65
Hicks Speed Indicator Co..... 79
Hoffecker Co. 73
Hoffman, Geo. W..... 56
Holley Bros. Co..... 94
Holsman Automobile Co..... 75
Hotel Amsterdam 55
Hotel Gilsey 80
Hotel Pierremont 80
Hotel Piney Woods Inn..... 80
Hotel Richmond 80
Hotel Tuler 80
Howard Motor Works..... 68
Hoyt Electrical Ins. Co..... 70
Huff, E., Jr..... 72
Hydraulic Pressed Steel Co... 65

Imperial Motor Car Co.....106
Indestructible Steel Wheel Co. 57

Jackson Automobile Co..... 68
Jamesville Mfg. Co..... 65
Jeffery & Co., Thos. B.....111
Jencick Motor Mfg. Co..... 79
Johnson Sporting Goods Co., I. 69
Jones Speedometer 71
Joyce-Cridland Co.....100

K. W. Ignition Co..... 70
Kimball Tire Case Co..... 78
Kinsler Bennett Co..... 81
Kissell Motor Car Co..... 73
Knox Automobile Co.....105
Koontz & Co., J..... 76
Kokomo Electric Co..... 89
Konigslow, Otto 74
Lansing-Mahon Press 81
Lavalette & Co..... 70
Lear Automobile Co., Oscar... 68
Leather Tire Goods Co..... 69
Limousine Carriage Mfg. Co... 66
Lipman Mfg. Co..... 74
Lobee Pump Co..... 57
Locke & Co..... 84
Lockwood Bros. 89
Locomobile Co. 68
Logan Construction Co..... 68
London Auto Supply Co..... 66
Long Mfg. Co..... 79

Macbeth-Evans Glass Co. 88
Manhattan Storage Co..... 74
Maple City Mfg. Co..... 76
Mason, John A..... 66
Masury & Son, John W..... 87
Matheson Motor Car Co.....101
Mayo Radiator Co..... 69
McCord & Co..... 74
Merchant & Evans Co..... 83
Merritt & Co..... 56
Meyers & Sons, C. G..... 66
Mezger, C. A..... 90
Michelin Tire Co..... 61
Midgley Mfg. Co..... 65
Midland Motor Car Co..... 60
Miller Bros. 78
Miller, Chas. E..... 83
Miller & Starr..... 71
Mitchell Motor Car Co..... 68
Model Automobile Co.....103
Moline Automobile Co..... 68
Moon Motor Car Co..... 68
Morgan & Wright..... 97
Mosler & Co., A. R..... 66
Moss Photo Engraving Co..... 89
Motz Clincher Tire & Rub. Co.. 69
Mutty Co., L. J..... 66
Motorcar Co. 84
Morrison-Ricker Mfg. Co..... 88
Motor Car Equipment Co..... 77
Mueller, Albert 77
Myers Auto Top Co..... 66

N. Y. Sporting Goods Co..... 57
N. Y. & N. J. Lubricant Co.... 83
National Auto Accessories Co. 56
National Motor Vehicle Co....105
Neustadt Auto & Supply Co... 90
Never-Miss Spark Plug Co.... 56
New Process Rawhide Co..... 81
Nordyke & Marmon Co..... 68
Northway Motor & Mfg. Co.... 78
Northwestern Storage Battery. 80
Nuttall Co., R. D..... 65

Ofeldt & Sons..... 56
Olds Motor Car Co..... 68

Pacific Tucking & Mfg. Co... 56
Packard Electric Co..... 67
Packard Motor Car Co.....110
Palmer & Singer Mfg. Co..... 70
Parish & Bingham..... 65
Parker, Stearns & Co..... 79
Pease & Sons, S. C..... 66
Penn. Auto Motor Co..... 68
Peugeot Frères 65
Perfection Grease Co..... 79
Perkins-Campbell Co. 67
Pfanstiehl Elec. Laboratory... 65
Picrome Hide Co..... 65
Pierce Engine Co..... 69
Pioneer Brass Works..... 65
Pirelli & Co..... 57
Pierce Co., Geo. N.....Cover
Portland Garage Co..... 65
Precision Appliance Co..... 55
Premier Motor Mfg. Co.....104
Prest-O-Lite Co. 77
Progressive Mfg. Co..... 82

Quinby Co., J. M..... 66

Raimes & Co..... 67
Rainier Co. 69
Rauch & Lang Carriage Co.... 95
Reeves Pulley Co..... 77
Remington Tool & Machine Co. 85
Remy Electric Co..... 55
Republic Rubber Co..... 78
Rex Wrench Co..... 61
Richardson Engineering Co.... 57
Robert Instrument Co..... 56
Robinson & Son Co..... 68
Rock Island Tool Co..... 82
Ross Gear & Tool Co..... 65
Royal Equipment Co.....57-Cover
Rushmore Dynamo Works..... 99

Salisbury Wheel Mfg. Co..... 96
Samson Leather Tire Co..... 99
Seaboard Florida Limited..... 98
Selden Motor Vehicle Co..... 75
Shawver Co. 71
Smith Mfg. Co., R. H..... 57
Spacke Machine Co., F. W.... 84
Spare Motor Wheel of Am.... 86
Speed Changing Pulley Co..... 82
Spicer Universal Joint Mfg. Co. 65
Splitdorf, C. F..... 71
Sprague Umbrella Co..... 92
Springfield Metal Body Co.... 66
Stanley, John T..... 87
Standard Automatic Lub. Co.. 66
Standard Co. 87
Standard Oil Co..... 94
Standard Welding Co..... 85
Steam Carriage Boiler Co..... 70
Stearns Co., F. B..... 69
Stevens-Duryea Co. 73
Stitch-in-Time Vulcanizer Co. 75
Streator Motor Car Co.....104
Streit Machine Co..... 70
Studebaker Automobile Co.... 62
Success Auto Buggy Co..... 69
Supplementary Spiral Spring.. 88
Swinehart Clincher Tire Co... 81
Syracuse Aluminum & Bronze Co. 65

Thomas Motor Co., E. R..... 83
Thompson Sons Co., J. P..... 71
Tray Plate Battery Co..... 82
Trebert Gas Engine Co..... 69
Tucker, C. F..... 56
Turner Brass Works..... 65
Two Spot Mfg. Co..... 84

Uncas Specialty Co..... 78
Utility Co. 83

Veeder Mfg. Co..... 89

Walden Mfg. Co..... 55
Warner Instrument Co.....102
Warner Pole & Top Co..... 66
Watt-Detroit Carbureter Co... 61
Waukesha Motor Co..... 84
Wayne Automobile Co..... 69
Weed Chain Tire Grip Co..... 76
Welch Motor Car Co..... 84
Western Motor Co..... 81
Weston Elec. Instrument Co.. 90
Wheeler & Schebler.....102
White Co., The.....107
Whitmer & Rung..... 83
Whitney Mfg. Co..... 85
Winton Motor Carriage Co....112
Witherbee Igniter Co..... 88
Wyman & Gordon Co..... 55
York Motor Car Co..... 69

FOR UNMATCHABLE QUALITY BUY

COES

91

STEEL HANDLE MODEL WRENCH

91

THE WRENCH for Automobilists

High-grade quality in every detail of design, material, workmanship and up-to-date improvement. Excellence with extremely reasonable cost.

NON-BREAKABLE CASTINGS
NON-STRIPABLE THREADS
NON-TROUBLESOME PARTS

QUALITY
Through and Through.

70 years splendid reputation worthily maintained right up to the present time as the World's Best Wrench Makers.

Write for "Wrench Book" free.

Look for the name—COES

COES WRENCH CO., WORCESTER, MASS.